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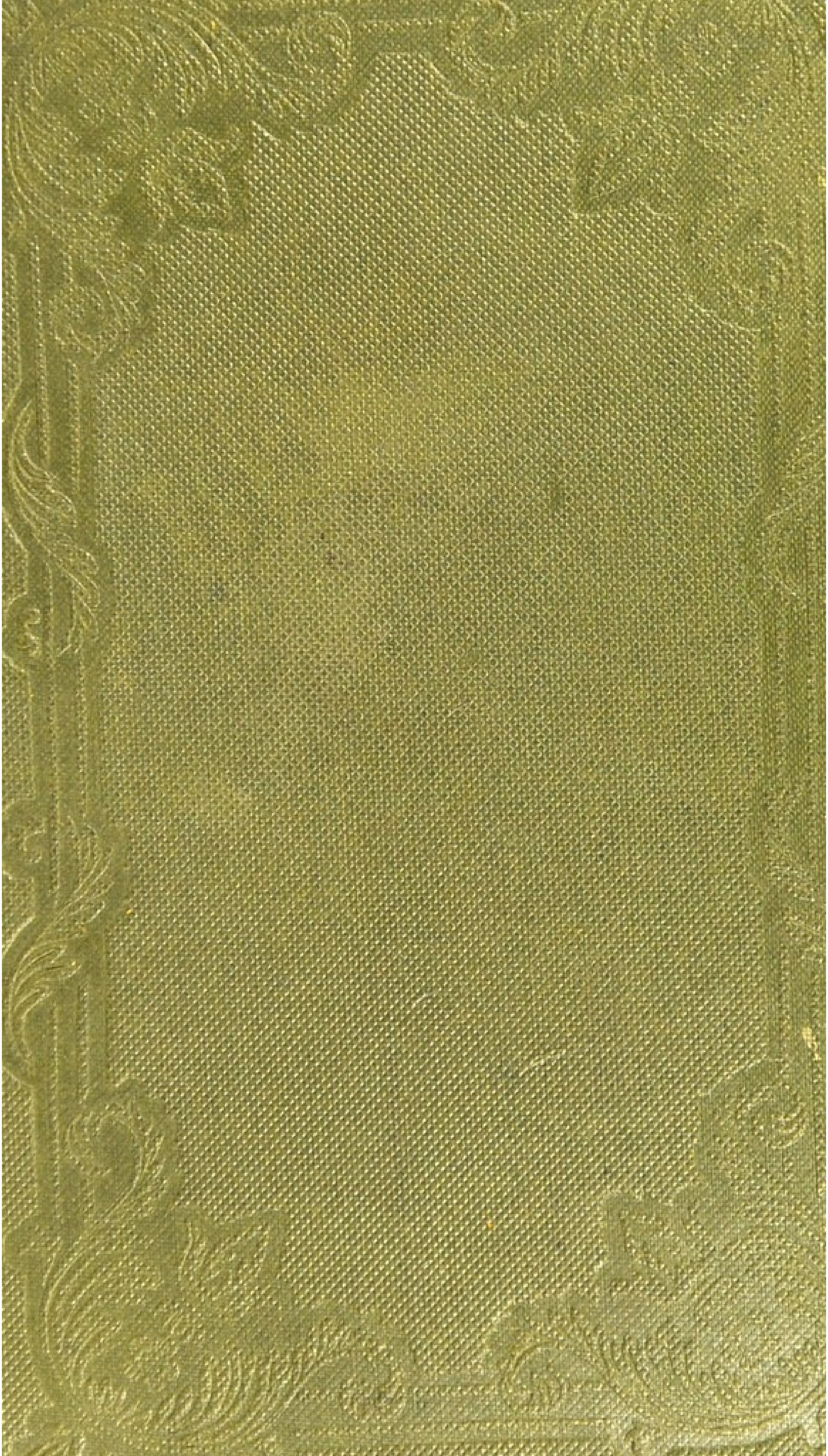

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A MANUAL

OF

MATERIA MEDICA AND THERAPEUTICS.

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MATERIA MEDICA AND THERAPEUTICS

INCLUDING THE PREPARATIONS OF THE

BRITISH PHARMACOPŒIA (1867),

AND MANY OTHER APPROVED MEDICINES.

BY

J. FORBES ROYLE, M.D., F.R.S.,

AND

FREDERICK W. HEADLAND, M.D., B.A., F.L.S.

Fifth Edition.

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PREFACE TO THE FIFTH EDITION.

In preparing the later Editions of this Manual of Materia Medica, every effort has been made to render it complete as a text-book of the subject on which it treats.

The Fourth Edition was remodelled throughout on the basis of the British Pharmacopœia of 1864; the Fifth has been adapted to the Second Issue of that work in 1867. In this Manual the medicines of the British Pharmacopœia will be found arranged in natural order, the preparations described at length, and the Formulæ explained.

Other Medicines and Preparations, mentioned only in the London Pharmacopœia of 1851, are separately described and included within brackets.

All Remedies of value, whether officinal or not, whether of established reputation or recent introduction, are noticed in their place in this Manual.

TABLE OF CONTENTS.

MANUAL OF MATERIA MEDICA AND THERAPEUTICS.

"Materia Medica and Therapeutics," being the title of one of the courses of lectures attended by students of medicine, is adopted as that of this Manual, because it treats of the same subjects; that is, it gives an account of the substances and agents which are employed as remedies for the relief or cure of disease.

The subject divides itself naturally into two distinct branches.

1. Materia Medica; meaning, correctly, the material substances employed as medicines; although it often includes other means employed with the same object. It treats of their natural characters, sensible properties, chemical qualities, and mode of action as medicines.

2. Therapeutica, from θεραπεύω, *to take care of* the sick, to heal. Therapeutics, in the most comprehensive sense, includes the application of remedies for the prevention or cure of disease. As connected with Materia Medica, it treats of the modes of action and of the effects of medicines as employed for the restoration of healthy action, and the consequent removal of disease. Since a variety of substances are capable of producing the same general effects, though they may differ from each other in minute particulars, they are frequently grouped together, so as to form classes of Medicines. These are convenient for practical purposes, because what is best suited to the peculiarities of a constitution, or to the different stages of any particular case, may, by their help, be more easily selected; or one remedy may be substituted for another, when the first has begun to lose its effect.

"Materia Medica and Therapeutics hold a middle place between the purely scientific and the strictly practical branches of professional study. Of the former, Natural Philosophy and Chemistry treat of the properties and intimate relations of all natural substances, as well as of the powers of nature. They form necessary preliminaries for fully understanding any of the natural sciences, and thus become a part of the studies of other professions as well as of medicine. Botany and Comparative Anatomy, treating of the structure and physiology of plants and of animals, as well as of their classification, geographical distribution, and uses to man, are equally essential objects of study to those who wish only to attend to agricultural or to horticultural pursuits, or to improving the breeds of animals. Even Human Anatomy and Physiology are often studied by those who desire only to become acquainted with the internal structure and functions of the body to perfect themselves as painters or as sculptors, or who desire to study the beauty and design displayed in the works of the Creator.

"The strictly practical branches of professional study—of which the principles, however, require also to be scientifically studied—are embraced in the departments of Surgery, Medicine, and Midwifery, which elucidate the nature and treatment of diseases, both external and internal, as well as those peculiar to women and children, and of the process of parturition. To these is superadded Forensic Medicine, a complicated branch of study, as it is connected with every other, and requires a knowledge both of healthy and of diseased structure, as well as of the effects of deleterious agents on the constitution.

"The practical sciences require for their study and practice a complete knowledge not only of their own particular subjects and of the above-mentioned preliminary sciences, but also of the agents and substances, whatever be their nature, which are called Remedies, and which are employed to alleviate or to remove all departures from the healthy state, or what constitutes the disease."*

A complete knowledge of Medicines comprises an acquaintance with their physical and chemical characters, their physiological action, and therapeutical effects. Medicines have been defined to be, all substances which have the power of modifying the actual state of one or more of our organs, and which possess this property independent of their nutritive qualities. Hence they are administered in disease, for the purpose of curing or relieving. M. Barbier gives, as a distinctive character of remedies, the property of not being decomposable, nor of being easily transformed into chyle by the action of the stomach. Alimentary substances, on the contrary, are digested, and transformed into chyle. This, however, will not apply to all; for some of the vegetable salts, as the acetates, citrates, and tartrates, are converted into carbonates in passing from the stomach into the excretions; while it is hardly correct to say that other substances strictly nutritive, such as fibrin and albumen, are decomposed. It is clear that aliments are assimilated to our organs, and become an integral part of our bodies; whilst remedies do not contribute in a direct manner to nutrition. It is equally difficult to define remedies as distinct from poisons; for, in fact, many of the same substances act either as remedies or as poisons, according to the quantities in which they are applied to our organs.

Before knowing how and when to prescribe a medicine, its nature ought to be thoroughly understood. A knowledge of medicines,

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* Medical Education, a Lecture delivered at King's College by Dr Royle. Session 1844-45.

therefore, comprehends an acquaintance with their external character, their sensible properties, and their chemical nature, as well as their modes of preparation. With these should be included some knowledge of the Natural History of the Animals, Plants, or Minerals which yield them. In order to prescribe them as efficient agents for producing changes in different organs and functions, we must be acquainted with their mode of action on the several tissues and organs, as well in a state of health as in disease,—that is, with both their Physiological action and their Therapeutical effects. With all this must be combined a knowledge of the forms in which they may most fitly be prescribed, the substances with which they may be combined, or with which they are incompatible, the doses in which they must be given, and the cautions which peculiar circumstances may render necessary: all which is embraced in the theory and art of prescribing, together with the rules for the diet and treatment of the sick and convalescent.

It is hardly necessary to state, that, for the purposes of Materia Medica and Therapeutics, so much only of the sciences connected with the above subjects requires to be known as to enable the mode of action and effects of substances, when employed as remedies, to be appreciated. These cannot be fully discussed in this Manual, for they include, in fact, a large portion of the objects of scientific study. Thus, the affections of the mind and the passions are treated of in systems of Mental and of Moral Philosophy. The general powers or forces of nature, such as Heat, Light, Electricity, and Magnetism, as well as the nature and constitution of the Atmosphere and of Water, as also the subject of Climate, are discussed both by the Natural and by the Chemical philosopher.

The material substances commonly called Medicines being necessarily obtained from the Mineral, the Vegetable, and Animal Kingdoms, might be expected to be treated of with the minerals, plants, or animals which yield them, in works of Natural History, that is, of Mineralogy, of Botany, and of Zoology. This, however, is seldom the case, except so far as their external characters are concerned, which require to be observed for the purposes of classification. The internal structure of the plants and animals which yield them are examined by vegetable and comparative anatomists. The composition of *organic* beings and of their products, as well as of mineral substances, is ascertained by the chemist. The mineral kingdom is sometimes distinguished, by the name of *inorganic*, from the vegetable and animal, which differ very conspicuously, in the different parts of each, however constituted, or howsoever composed, being *organised*. They are thus calculated to perform particular functions, which are controlled by the vital powers, and form the objects of study for Vegetable and Animal Physiologists.

Though for the study of Materia Medica it is not requisite to master these various sciences, yet as we wish to acquire an accurate knowledge of the nature of medicines, the modes of classification pursued in these several sciences may be adopted as the best means of attaining that object. Indeed, this mode of studying animal, vegetable, and mineral substances may with advantage be considered as an abridged view of their respective sciences, in which the principles and classification are briefly treated of, and the details exemplified by medicinal substances.

The products of the mineral kingdom being inorganic, and also more simple in composition, it becomes desirable to study them first; so that we may proceed from simply observing the external characters and chemical composition of minerals, to consider the complicated structure and functions of organised bodies. Medicines from the mineral kingdom may be arranged either according to their external characters, as in some systems of mineralogy, or according to their chemical composition, as is the case in others, as well as in systems of Chemistry. The latter plan affords numerous advantages, besides enabling the substances which are produced in nature to be arranged together with those which are the result of pharmaceutical operation, as many of these are of a chemical nature.

OPERATIONS OF PHARMACY.

MEDICINAL substances, as produced by nature, not being always fit for immediate exhibition as Medicines, require a number of preliminary processes, which are called Operations of Pharmacy.

These relate—1. To the choosing, collection, and preservation of Drugs. 2. Their preparation, to fit them for exhibition as Medicines, including their mixture and combination. For the sake of uniformity, these require to be ordered by authority, and are so in the several Pharmacopœias.

The British Pharmacopœia of 1864, issued by the General Council of Medical Education and Registration, in accordance with the Medical Act of 1858, superseded the Pharmacopœias of London, Edinburgh, and Dublin, and established the long-desired uniformity in the preparation of medicines and the compounding of prescriptions throughout the United Kingdom. The improved edition, issued in 1867, is for the present the sole authority recognised by law for the guidance of Apothecaries and Druggists throughout the United Kingdom.

The choosing of Drugs necessarily implies a knowledge of the whole subject, as all the characters both of genuine and of adulterated drugs should be well known before they are selected or purchased, or an attempt is made to prescribe them. For this purpose all the external characters, as colour, smell, taste, form, consistence, comparative weight, fracture, degree of solubility, point of fusion, &c., also their chemical nature and composition, must be noticed, and their purity be ascertained by means of *Chemical Tests.*

The collection of Drugs requires, in addition, that the influence of different Physiological states, both in plants and animals, should be attended to. Hence season, situation, aspect, age, habit, the natural or cultivated states,—are all of importance.

The Preservation of Drugs requires attention to the best methods of drying both mineral and organic substances, as well as to the necessity of protecting many of them from the influence of air, of moisture, and of light. To protect them from the latter, black or green bottles are ordered for particular preparations.

Drugs require to be weighed, both for Pharmaceutical preparations and in dispensing. The weights of the British Pharmacopœia have been assimilated to those in use throughout the kingdom. The Avoirdupois weight has been substituted for the Troy weight so long adopted in Pharmacy, and retained in the last edition of the

London Pharmacopœia. The grain is the same as the grain of the Troy weight, but the Imperial Pound weighs 7000 grains, and is divided into 16 ounces, each of 437½ grains.

IMPERIAL WEIGHTS.

One Pound .	℔	= 16 oz. =	7000 grs.
" Ounce .	℥	= . . .	437·5 "
" Grain .	gr.	= . . .	1 "

This weight was first adopted in the Dublin Pharmacopœia of 1850, which, however, retained the old pharmaceutical weights of the drachm and the scruple, the drachm being the eighth part of the ounce, or 54·7 grains, the scruple the third part of the drachm, or 18·22 grains. These weights are somewhat smaller than the drachm and scruple of Troy weight, as will be seen in the table below. As the Troy or Apothecaries' weight is on many accounts convenient for prescribing, and it will probably be long before its use is discontinued, we subjoin the table of this weight for purposes of comparison. It must be remembered that the drachm and scruple weights are no longer used in the Pharmacopœia, though frequently resorted to by prescribers.

TROY WEIGHTS.

One Pound .	℔. i. =	12 Ounces .	℥ xij. =	5760 grs.
" Ounce .	℥ i. =	8 Drachms	ʒ viij. =	480 "
" Drachm	ʒ i. =	3 Scruples .	℈ iij. =	60 "
" Scruple .	℈ i. =	20 Grains .	gr. xx. =	20 "
" Grain .	gr. i.			

One pound, or twelve ounces, Troy, equals thirteen ounces and seventy-three grains of the Avoirdupois weight.

Liquids used formerly to be weighed, but as it is much more convenient to measure them, this method is now generally adopted. The Wine Measure was formerly employed; but the Imperial Gallon is now used, and is thus divided and distinguished :—

IMPERIAL MEASURE.

				Minims.	Old Wine Measure.
One Gallon . .	C i. =	8 Pints . . .	O viij. =	76800	61440 = O viij.
" Pint . . .	O i. =	20 Fluid ounces	f℥ xx. =	9600	7680 = f℥ xvj.
" Fluid ounce	f℥ i. =	8 Fluid drachms	fʒ viij. =	480	480 = fʒ viij.
" Fluid drachm	fʒ i. =	60 Minims . .	♏ lx. =	60	40 = ♏ lx.
" Minim . .	♏.				

The Imperial Gallon and Pint evidently contain much more than the Wine Measure, in the proportion of about 5 to 4; but by dividing the Pint into f℥xx, instead of into f℥xvi, we obtain nearly the same quantities for the ounce, drachm, and minim. An Imperial ounce is equal to 7 drachms and 41 minims of the Wine Measure.

It must be remembered that a minim does not weigh exactly a grain. The imperial minim of water weighs ·91 grains, and the fluid drachm 54·7 grains.

A Gallon is the measure of 10 lbs. of water. The Pint measures 1¼ lb. The fluid ounce is the measure of an ounce of water.

Bodies occupying the same space are, however, well known to differ much in weight, as, for instance, Lead and Cork, in consequence of the former containing more matter in the same space than the latter ; or, in other words, lead has a greater *density* than cork. Bodies are, therefore, weighed under two points of view : first, with respect to their absolute weights, and secondly, with reference to that which is peculiar to each *species*, and is hence called *Specific Gravity*. This refers to the comparative weights of different bodies occupying the same space and referred to a common standard. As the quantity of matter within the same space differs very much according as it is more or less expanded by heat, so the Sp. Gr. of bodies is always referred to one temperature, that is 60° ; in the L. P. it was 62° of Fahr. The quantity of a medicinal substance, as of an acid, an alkali, or a spirit, may, moreover, vary very much in the same bulk according as it is more or less diluted with water. And as this fluid will be either lighter or heavier than water, its solution will thus be heavier or lighter, exactly according to the degree of dilution. The strength, therefore, which is the same thing as the Sp. Gr., requires to be ascertained, both for Pharmaceutic and for Medicinal purposes. Water is, for convenience, taken as the standard to which the comparative weights of other bodies are referred ; but its Sp. Gr., though usually reckoned as 1, is by some taken at 1000, to avoid fractional parts.

The Sp. Gr. of a liquid may easily be ascertained by weighing it in a bottle which holds exactly 1000 grains of water at 60°. Solids are weighed first in air, and then, when suspended by a hair, in water. In this case, they displace a quantity of water equal to their own bulk, and weigh less than in air, because they are supported by the surrounding water with a force equal to the weight of water which has been displaced. So that the loss in the weight will denote the weight of an equal bulk of water. This then is the rule : find the difference between the weight of the body in air, and when weighed in water ; take this difference to divide the weight of the body in air, and the quotient will be the specific gravity. The Sp. Gr. of aëriform bodies is ascertained by weighing certain measured quantities when passed into a vessel exhausted of air, and of which the weight has been previously ascertained. The different gases vary very much in their Sp. Gr., but they are all referred to Atmospheric air as a standard. By careful experiment, it has been found that 100 cubic inches of air weigh 31·0177 grains at 60° of Temperature and 30 inches of Barometrical pressure.

Professor Daniell has given the following table of the Sp. Gr. of the lightest gas, of air, of steam, and of water :—

Cubic inches.	Weights, Grains.	Sp. Gr. Air 1.	Sp. Gr. Water 1.
Hydrogen 100	2·136	0·0694	0·0000846
Air . . . 100	31·000	1·0000	0·0012277
Steam . . 100	19·220	0·6240	0·0007611
Water . . 100	25250·000	814·0000	1·0000000

MECHANICAL OPERATIONS OF PHARMACY.

Before Drugs can be exhibited as Medicines, they require to undergo a variety of processes, some of a Mechanical, others of a Chemical nature. Of the first kind some are intended merely to effect Mechanical Division. This is useful in two ways : first, in assisting the chemical action of bodies upon each other, and secondly, in rendering them more easy of administration as Medicines. Some substances must be subjected to preliminary operations, as Cleaning, Cutting, Bruising, Grating, Rasping, Filing ; or they may be powdered in mortars of wood, iron, wedgwood, glass, &c. ; or ground in mills or between rollers. The different modes are sometimes distinguished by distinct names :—

Pulverisation by Contusion,	as Pounding of Tough substances.
,, Trituration,	Rubbing to a fine powder.
,, Grinding,	as in Mills and between Rollers.
,, Friction,	as with a grater, file, or rubbing.
,, Porphyrisation,	on a Slab with a muller.
Mediate Pulverisation, .	when substances are added to assist the process, and are afterwards washed out.
Levigation, . . .	Fine Trituration with water, or any fluid in which the solid is not soluble.
Granulation, . . .	when melted metal is agitated till it cools, or is shaken in a box, or poured from a height into cold water.

As the finest powders prepared by the above means always contain some coarse particles, so methods are adopted by which the particles of bodies may be mechanically separated. Thus, Pharmaceutists adopt—

To separate solids from solids,	
Elutriation, or washing, .	The fine particles, being suspended, are poured off from the coarser, and are then allowed to settle.
Sifting, as with Sieves, .	Sieves may be simple or compound, of wire, perforated zinc, hair, or gauze ; or the fine particles may be dusted through bags.
To separate fluids from solids,	
Decanting : Deposition, .	when performed for the sake of the solid.
,, Defæcation, .	,, ,, of the fluid.

Or the fluid may be sucked off with a sucking-tube, or removed with a syphon.

Filtration, ...	with Funnels and Filters ; woollen or paper filters, or powdered glass, or Charcoal and sand, may be used.

Expression, . . .	for separating vegetable juices, or pulp of fruits, oils, &c., from ligneous fibre, &c.
Clarification, or Despumation,	by adding different substances, as Albumen, or the white of egg, or isinglass, when a scum rises to the surface, or falls to the bottom, carrying impurities with it.

Fluids may be separated from fluids, when there is no affinity between them, and they are of different specific gravities ; as by decanting, skimming-off, the use of the Separatory, or by a Syringe, &c.

Several preparations fitted for exhibition as Medicines are prepared by the above mechanical processes with the addition of mixing, such as Powders, Pills, Confections, Electuaries, Lozenges, Mellita, Mixtures, Cerates, Ointments, Plasters.

CHEMICAL OPERATIONS OF PHARMACY.

Mechanical operations are concerned either in altering the state of aggregation of a substance, or in separating mechanically some bodies from others ; but in this second class of processes we avail ourselves of chemical laws to effect an actual change in the state of a body, so that it may be presented to us in a different form, condition, or state of combination. Those operations only will now be considered which involve simply a change of condition, and not of chemical composition. They are Fusion, Solution, Vaporisation, Precipitation, and Crystallisation. In most cases the agency of *Heat* is concerned.

Temperature is measured by Fahrenheit's Thermometer, of which the Freezing Point is 32° and the Boiling Point 212°. A gentle Heat means any degree between 90° and 100°. A Water-Bath signifies an apparatus for heating by boiling water or by steam ; a Sand-Bath, one in which a vessel is placed and warmed by the gradual heating of sand.

FUSION, or melting produced by increased temperature, is practised with metals, wax, &c. Bodies first dilate, and then, if not decomposed, they melt, and each always at the same temperature. No further increase of temperature then takes place, as all subsequent additions of caloric became latent. Fusion may be effected in metallic vessels, in the open air, as in furnaces, or in crucibles. Crucibles may be of clay, porcelain, silver, platinum, &c. In some cases fluxes are required.

SOLUTION.—When a fluid, as water, alcohol, ether, oil, &c., overcomes the cohesion of a body, and incorporates its particles within itself, without decomposing them, itself remaining transparent. When unable to dissolve more, it is said to be saturated. Heat usually, but not always, increases the solvent power of a liquid. Solution is favoured by the quantity of the solvent, by division, and by agitation, also by pressure. Cold is produced during solution, from a portion of the caloric of the liquid being required to enable the solid to pass into the same state. Hence freezing mixtures are produced by dissolving salts in water, or by mixing them with ice or snow.

Solutions of a Homogeneous solid. 1. In pure Water, as of Acids, Alkalies, and of Salts, or of certain vegetable and animal principles, as Gum, Sugar, Starch, or of Gelatine and of Albumen. 2. In Alcohol and Proof Spirit. Vegetable Alkalies are generally soluble in Alcohol, so is Iodine. 3. In Ether: this solvent is capable of dissolving many of the same substances as Alcohol, and more of some resins, fats, and vegetable principles. 4. In Oil. This dissolves Phosphorus, Camphor, and some of the acrid and narcotic principles of plants, whence the French employ several Oils. 5. Glycerine dissolves many solids, and is used to form the *Glycerines* of the B. P. (1867).

Solutions of a Heterogeneous solid are differently named, according to the temperature employed. 1. Maceration is an operation performed at ordinary temperatures, as from 60° to 80°, and which is continued for some time, as from 12 hours to a few days. *a.* With pure water as a solvent, forming cold infusions, which are useful when we wish to prevent aroma being dissipated, or to obtain a light infusion, free from principles which would be taken up if heat was employed. *b.* In Rectified or Proof Spirit, forming Tinctures, the former for the resinous, and the latter for the more gummy products of plants. The Tinctures may be either *Simple* or *Compound*, that is, when one, or when more than one, substance is acted upon by the solvent. Sometimes Ammonia is added, forming Ammoniated Tinctures. *c.* Ether is occasionally employed in making what are then called Ethereal Tinctures. *d.* Wine, used as a solvent, forms Medicated Wines, and is preferred for taking up some of the soluble principles: as in Vinum Colchici, V. Ipecacuanhæ, V. Opii. *e.* Vinegar is sometimes used as a menstruum, and preferred for some vegetable principles; as in Acetum Cantharidis, and A. Scillæ.

2. Percolation is a kind of Maceration, but superior to it in its power of exhausting a body of its active soluble principles. This is effected by more minute subdivision of the solid, and by passing the liquid through it, and thus bringing all its particles in contact with the whole of the menstruum. The solvent can then be used upon fresh portions of solid, which may be similarly exhausted until the liquid becomes of the desired degree of strength.

3. Digestion is similar to Maceration, but the action is promoted by a heat from 90° to 100°.

4. Infusion.—When boiling water, that is, at 212°, is poured on the leaves, barks, or roots, &c., of plants, and allowed to cool down. Many substances require first to be bruised or cut, so as to be permeable to the water. Polished metallic vessels, as they cool more slowly from radiating heat less freely, are usually preferred to make infusions in.

5. Decoction.—When boiling water is used, and kept boiling for a shorter or longer period, all the principles soluble in water become

dissolved, and some others are suspended with them. Decoctions are preferred when the full effects of some medicines are required. In other cases the aromatic principles are dissipated.

Vaporisation.—By this operation liquid bodies become converted into vapours or gases. This may take place only at the surface of the liquid, when it is called Evaporation ; or, if the vapour is formed by the addition of caloric throughout the whole mass, Ebullition. (Simple vaporisation is resorted to in applying the Vapours or Inhalations of the B. P., 1867.)

Evaporation is adopted when a volatile liquid is allowed to escape, and a solid residue retained for use ; as in the case of Extracts, Inspissated Juices ; or in crystallising salts, as in obtaining sea-salt. Evaporation, when taking place at ordinary temperatures, is called *spontaneous* evaporation ; and as it takes place at the surface, shallow vessels with broad surfaces are necessary. During evaporation, cooling ensues, in consequence of the quantity of caloric required for the liquid to exist in the gaseous state. Hence the coolness produced by evaporated lotions, by water in porous vessels, &c. The rate of evaporation increases as temperature is increased or pressure removed ; hence it occurs at a much lower temperature in vacuo. *Inspissated Juices* are reduced to comparative dryness by this process. Where the active principles of a vegetable or animal have been obtained in solution in alcohol or water, and are by such a process reduced to a proper consistence, we obtain *aqueous* or *alcoholic extracts*. As these are apt to be injured by heat, so it is of advantage to prepare them at as low a temperature as possible. Hence the superiority of those prepared in vacuo.

Ebullition taking place by additions of heat to the mass of liquid, a large quantity of caloric becomes latent (or hidden) to enable the liquid to exist in a gaseous state. The boiling point varies in different liquids. Ether boils at 100°, Alcohol at 173·5°, Water at 212°, Oil of Turpentine at 316°, Mercury at 656°. It is also influenced by other circumstances, but especially by pressure, as fluids boil at 140° lower temperature in vacuo than in the open air. When pressure is increased, the boiling point is raised, and often also the solvent powers of the fluid. Boiling is employed in making Decoctions, &c., and also in the process of Distillation.

Distillation is employed in separating a volatile liquid from other substances which are either fixed or less volatile than itself. It consists of two processes : first, the application of heat to convert the volatile substance into vapour, and then the condensation of this vapour, in a separate vessel, into a liquid. The operation may be performed in a retort or still, to either of which a receiver, kept cool, or a refrigeratory, must be fitted. The vessels may be of metal, of glass, or of earthenware, and the heat applied either directly or through the medium of a sand, water, or steam bath.

Distillation of Water.—Distilled water is required to be employed in all the Pharmacopœia Preparations.

Distillation of Distilled Waters.—These contain a little of the volatile principles of plants, and may be distilled either off the plants, or by distilling some Essential Oil with water.

Distillation of Essential Oils.—Volatile Oil being diffused through the different parts of various plants, these are, if necessary, coarsely divided, and soaked in water. The oil is then distilled over with the water, from which it is afterwards separated as it floats upon the surface.

Distillation of Acids.—As of Acetic, Nitric, Hydrochloric, Hydrocyanic acids, &c., or of Vinegar for purification.

Distillation of Alcohol.—This is first obtained in the form of Raw Spirit. It is rectified for the purpose of purification, and also for concentration, and has then a Sp. Gr. of ·838, while that of Proof Spirit is ·920. Rectified Spirit may be further strengthened by distilling it off Carbonate of Potash or dry Chloride of Calcium, which retain the water, while the Volatile Alcohol is distilled off.

Distillation of Distilled Spirits.—These are colourless solutions in Alcohol of the volatile principles of plants, and are obtained by distillation in the same way as the distilled waters, but with rectified or proof spirit as the solvent.

Sublimation is distinguished from Distillation in the volatilised matter assuming a solid form on condensation, as in the cases of Sulphur, Sal Ammoniac, Iodine, &c.

Condensation.—In the Processes of Distillation and of Sublimation bodies are first converted into vapour, and then reduced to the liquid or solid state by the simple reduction of temperature. The condensation of gases, or those which are permanent at ordinary temperatures and pressure, may be effected by increasing the pressure or by the application of great cold. Professor Faraday, by combining the condensing powers of mechanical compression with that of very considerable depressions of temperature, has obtained a pressure equal to 50 atmospheres, and a cold equal to $-166°$ of Fahrenheit's scale, and has thus liquefied many previously uncondensed gases. Condensation of a gas may also be effected mediately, that is, by passing it through a liquid for which it has some affinity, or through which it may become permeated : *ex.* Solution of Ammonia, Liquid Hydrochloric acid, Carbonic acid water. The terms Congelation or Solidification are employed when a body assumes the solid form from the mere reduction of temperature.

PRECIPITATION is the process by which a body, previously in solution, is caused to pass to the solid state so rapidly as to prevent the particles arranging themselves in any regular form, and therefore the *precipitate* falls as a more or less fine powder.

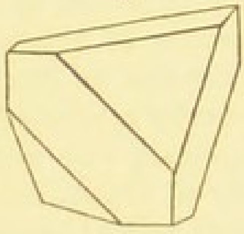
CRYSTALLISATION.—When bodies in passing from the liquid or gaseous state assume regular geometrical forms, the process is called *crystallisation*, and the solid bodies, *crystals.* This may be effected by gradually cooling down any melted mass, as Sulphur, the Metals ; or a vapour, as Sal Ammoniac or Corrosive Sublimate ; or by slowly evaporating the liquid in which a solid may have been dissolved. The process then, depending on evaporation, requires to be performed in broad and shallow vessels. It is favoured by the presence of foreign bodies, &c., and by agitation ; but the crystals then produced are small, as also when the process is quickly performed.

The majority of crystals, when deposited from their watery solutions, carry with them a certain portion of water, which they render solid, but much of which they also part with by the mere application of heat or by exposure to the air. This is called *water of crystallisation*, and it exists in crystals in its equivalent proportion, or some multiple of it. Professor Graham considers a portion of this water, when it replaces a base, as essential to the *constitution* of the salt. This is then sometimes described as *water chemically combined.* A salt or body *combined* with water is called a *hydrate*, one without any, *anhydrous*. Salts which contain much water of crystallisation, when heated, undergo aqueous fusion, and, the water being dissipated, they are left as dry salts : *e.g.* burnt Alum. Some, when exposed to the air, lose this water, and are said to *effloresce ;* others absorb water, and are said to *deliquesce ;* while those which undergo no change in the air are called *permanent.*

Crystals are also studied with respect to their forms and the nature of their formation. Crystallography is now an extensive and independent science, the principles only of which we need notice, as they are treated of in separate works, as well as in systems of Chemistry. As many substances have forms peculiar to themselves, it is necessary to be acquainted with those which characterise different pharmaceutical salts, as they may thus be distinguished even when very minute. Some forms, however, are common to several distinct minerals, and these are therefore sometimes grouped together according to their external characters. The forms of these crystals have been distinguished into those which are *Primary*, and others which, from being considered as modifications of them, are called *Secondary.* That the *external forms* are connected with a certain regularity of *internal structure*, is evident from the well-known facts of the *cleavage* of crystals, also their refraction of light and different degrees of expansion by heat. The primitive forms are,—1. The Cube. 2. The Tetrahedron, contained under four equilateral triangles. 3. The Octohedron, contained under eight equilateral triangles. 4. The Hexangular Prism. 5. The Rhombic Dodecahedron, limited by twelve rhombic faces ; and 6. The Dodecahedron with isosceles triangular faces. The secondary forms may be produced by modifications of the above, as by decrements of particles taking place on their *edges* and *angles*, which would produce a great variety of forms. Thus the Octohedron, Tetrahedron, and others, may be produced from a Cube, and many secondary forms from each.

Though there can be no doubt that the internal structure of crystals must be as regular as their external figures, because it seems evident from the unequal expansion and contraction of certain crystals by changes of temperature, and also from their different modes of refracting light, yet, to use Mr Daniell's words, crystallographers now confine themselves to the experimental determinations, and the geometrical relations of their exterior forms. Crystallography is now founded upon our ideas of the regular and exactly similar distribution of two, three, four, or any number of parts in symmetrical order ; and on the law that if one of the primary planes or axes of a crystal be modified in any manner, all the symmetrical planes and axes must be modified in the same manner.

1



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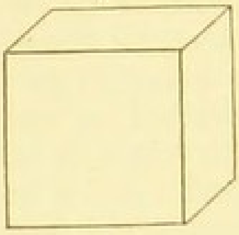

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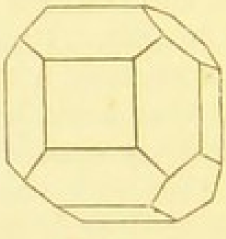

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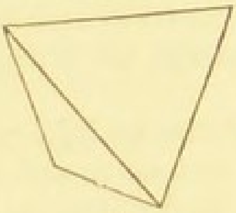

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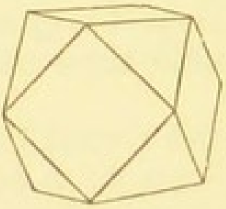

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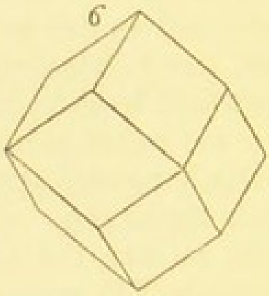

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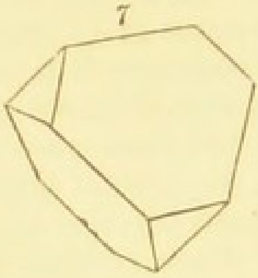

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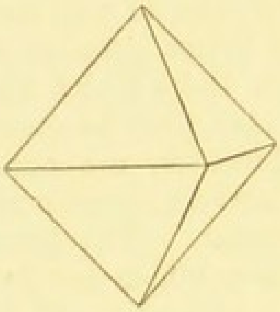

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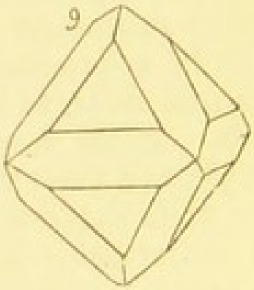

The introduction of a systematic arrangement of crystalline forms according to their degrees of symmetry, is due to the labours of Weiss and Mohs, and its principles are explained in Professor Daniell's Introduction to Chemical Philosophy. The classes and the forms which are referred to there will be enumerated here, as many of them are mentioned in the descriptions of crystals in this work.

I. *Cubic, Octohedral, or Regular System*, having 3 rectangular axes all equal ; contains the Cube, Regular Octohedron, Tetrahedron, Rhombic Dodecahedron, and Trapezohedron. II. *Right Square Prismatic System:* 3 rectangular axes, 2 equal, contains Square Prism and Octohedron with a Square base. III. *Rhombohedric:* 3 equal axes, not rectangular ; 1 perpendicular to the 3 ; Rhombohedrons, Bipyramidal Dodecahedrons, Hexangular Prisms. IV. *Right Rectangular or Rhombic Prismatic:* 3 rectangular axes, no two equal ; Right Rectangular Rhombic Prism, and Right Rectangular, and also Rhombic Octohedron. V. *Oblique Rectangular or Rhombic Prismatic:* 2 axes oblique, the third perpendicular to both. Oblique

Rectangular and also Rhombic Prisms; Oblique Rectangular and also Rhombic Octohedrons. VI. *Double Oblique Prismatic:* 3 axes all intersecting each other obliquely; Doubly Oblique Prism and Octohedron.

By these various processes are obtained the Pharmaceutical preparations which are known by the names of Solutions, Tinctures, Wines, Vinegars, Infusions, Decoctions, and Extracts; also Distilled Waters; Spirits and Essential Oils; likewise some Precipitates and Salts, though the production of these depends chiefly upon Chemical Decompositions and Combinations.

PHARMACEUTICAL CHEMISTRY.

Substances which are throughout identical in nature, are subject only to the ordinary laws of Physics; but when substances different in nature, and minutely subdivided, come into contact, or are placed at insensible distances from each other, they become subject to a series of changes consequent on Chemical Attraction or Affinity. The result of this attraction is to unite two or more bodies together into one which has properties usually very different from the bodies of which it is composed. One great object of Chemistry is to determine what bodies are compound, and what, from the inability of chemists to separate them into more simple bodies, should be considered as *Elements.* These are at present about 64 in number; new elements, like new planets, are being almost annually discovered. A majority of the most important of them form objects of study in Materia Medica, either in their simple form, or as constituents of compound bodies.

As most bodies, when judged of by external characters, appear to be homogeneous, or composed of only one substance, the object of the Chemist is to ascertain whether this is actually the case, or only apparent. This he does either by the Action of Heat, or by presenting to the compound body some other substance which has a greater affinity for one of its constituents, so that the other may be set free. This is called *Analysis*, or the separation of a Compound Body into its *constituent* parts, the quantities of each being, if necessary, ascertained. As a Compound Body is capable of combining with other bodies, which may themselves be either simple or compound, it is clear that by the process of *Chemical Analysis* a complex body may be reduced either into the substances from the immediate union of which it has been formed, and which are called its *Proximate Principles*, or into the *elementary* substances of which the latter consist, and which are then called its *Ultimate* Principles. When the constituent principles of a body can be so reunited as to reproduce the substance which has been analysed, the process is called *Chemical Synthesis*, and is the most certain proof of the correctness of an analysis.

These Decompositions and Recompositions, or Combinations, form the chief occupation of the Chemist, are always going on in the great operations of nature, whether of growth or of decay, and require to be studied especially with regard to the laws by which they are governed, which are called those of Chemical Affinity. It has been ascertained that though some substances, as Alcohol and Water, unite in any proportion, and others, as Salt and Water, in any proportion up to a certain extent, yet that the majority of substances which form *true* Chemical combinations, unite only in *one* or in a *few fixed* and *definite* proportions. This forms the basis of what is called the doctrine of Chemical Equivalents, Definite Proportions, or the Atomic Theory, the facts alleged in support of which have been ascertained by numerous experiments, though the explanations are theoretical.

The combination of Bodies is much influenced by the different states in which they are brought into apparent contact, and much favoured by bodies being brought into the state of liquids, and also in many cases by heat, as is fully detailed in works on Chemistry. It is requisite to allude to the points requiring to be studied, in order to understand even the ordinary Pharmaceutical preparations. Bodies, it has been stated, combine with one another, not only in one, but often in several *definite* proportions; and it has further been ascertained that the quantity of the equivalent of one of them in the different combinations is found to be exactly double, triple, or some multiple of that of the other, and in the ratio either of 1 to 1, 2, 3, or 4, &c., or of 1 to 3, 5, 7. This is indicated by a peculiar *Nomenclature.* The *weights* of these equivalents have been ascertained by experiment to differ from each other. Hence their relative differences are pointed out by *Numbers*, which are in most instances peculiar to each of the *elementary* bodies. For the convenience also of a brief mode of stating all the facts respecting the composition of a Chemical substance, particular letters are adopted as the *Symbols* of the different Elements, and *Formulæ* are used, which express the sum and differences of the substances employed in chemical decompositions and their results. Hence attention must be paid to the Equivalents, which are also supposed to be the atomic weights of Chemical Elements, the *Symbols* by which these are distinguished, and to the *Nomenclature* by which the composition of a Body is at once known. The great advantage of attending to these points is the facility which it gives for understanding complicated changes, especially in Organic Chemistry. They also show the exact quantities which are sufficient to produce particular changes, and indicate the weights of the products which should be obtained.

To indicate the composition of bodies as well as the proportions in which they are combined, a peculiar nomenclature is employed by Chemists. Thus, Binary compounds which are not acid, of the non-metallic elements, as Oxygen, Chlorine, Iodine, Bromine, have their names terminating in *ide*, as Oxide, Chloride, Iodide, Bromide; also of the compound body Cyanogen, as Cyanide; of other substances, as Sulphur, Phosphorus, in *uret*, as Sulphuret, Phosphuret.

The number of Equivalents or Combining weights in a compound is shown—Of the first-mentioned element, by a Latin numeral, as

Bis, Ter, *e.g.* Binoxide of Manganese, indicating that 2 equivalents of Oxygen are combined with 1 of Manganese. If 2 equivalents of one body combine with 3 of another, that is, in the proportion of 1 to 1½, this is indicated by the word *sesqui*, as Sesquioxide, Sesquichloride. The first oxide is sometimes distinguished as the Protoxide. The affix of *Per* to an acid or an oxide indicates the highest proportion of Oxygen, &c., as Peroxide, Perchloride, Percyanide. The numbers of the second-mentioned element are indicated by Greek numerals of division, as Dis, Tris, *e.g.* Diacetate of Lead, where 2 equivalents of Oxide of Lead are combined with 1 of Acetic acid.

The nature of the acidifying principle of acids is indicated by the term *Oxyacids* being applied to those containing Oxygen, and *Hydracids* to those acidified by Hydrogen, with the word *Hydro* prefixed, as in Hydrochloric. Acids containing the largest proportion of Oxygen have their names terminating in *ic*, as Sulphuric acid, and those of their salts in *ate*, as Sulphate, Nitrate. A smaller quantity of Oxygen in the acid is indicated by the termination *ous*, as Sulphurous; their salts terminate in *ite;* while the addition of *Hypo* indicates a smaller quantity of Oxygen than in the compounds to the names of which it is prefixed, as Hyposulphuric, Hyposulphurous. The excess of acid in a salt is indicated by calling it an *acid* or a *super-salt*, and the deficiency of the acid, by calling it a *sub-salt;* or, to show the excess of base, or of that which combines with and masks the properties of the acid, by calling it a *basic salt*. Double and Triple salts have their composition pointed out by the names of their Principles being all mentioned, as Tartrate of Potash and Soda or Potassio-Tartrate of Soda. A triple compound of the elementary bodies, as Oxygen, Hydrogen, and Carbon, as in Creosote, is called an Oxy-hydro-carbon.

Substances combined with water are called *hydrates*, as the Hydrate of Lime; and as it seems in some cases to act the part of a base, it is then called *basic* water. Compound bodies, such as Cyanogen, which unite with elements as if they were themselves simple substances, are called *radicals*. There are many among organic compounds. These groups of a few elements in infinitely varied proportions are capable of combining with elementary substances and with one another, and of being substituted the one for the other, according to the laws of definite, multiple, and equivalent proportions. (Daniell, Chem. Phil. p. 604.)

The Symbols by which Elementary substances are distinguished are the first letters of their names in Latin, sometimes with the addition of a small second letter. The following elements comprise those which are most generally diffused, and of about half of which the greatest portion of material substances are composed. All of these form components of articles in the Materia Medica. The Numbers of the Equivalents are those adopted in the British Pharmacopœia, and now in general use amongst chemists. In earlier editions of this work, we followed Brande, Phillips, and Prout, in making use of whole numbers for the equivalents. This plan had its advantages; but accurate researches have now proved beyond a doubt that in many cases the whole numbers do not express the true combining proportion. In these, as generally in this country, Hydrogen is taken as unity, and being found in water combined in the proportion of 1 with 8 equivalents of Oxygen, the number of the latter is taken as 8. As these numbers are arbitrary, so others may be assumed: hence Oxygen, on the Continent, is made 100; but, as the others must all be proportional, Hydrogen will then become 12·5.

According to the system called the New Notation, which finds favour with some chemists at home and abroad, the received equivalent numbers of many of the elementary bodies are doubled, and the formulæ of the compound bodies are altered accordingly. At present we shall retain the old system, which is followed in the list below, and throughout this work. But as the British Pharmacopœia of 1867 places the new and old formulæ side by side, we shall contrast them in a double column in an Appendix at the end.

NON-METALLIC ELEMENTS.

Oxygen	O	8	Bromine	Br	80
Hydrogen	H	1	Sulphur	S	16
Nitrogen	N	14	Phosphorus	P	31
Carbon	C	6	Boron	B	11
Chlorine	Cl	35·5	Silicon (not officinal)	Si	21
Iodine	I	127			

METALLIC ELEMENTS.

Kaligenous Metals.

Potassium (Kalium)	K	39	Sodium (Natrium)	Na	23
Lithium	L	7			

Terrigenous Metals.

Alkaline Earths.			*Earths Proper.*		
Barium	Ba	68·5	Aluminum	Al	13·75
Calcium	Ca	20			
Magnesium	Mg	12			

Metals Proper.

Manganese	Mn	27·5	Cadmium	Cd	56
Iron (Ferrum)	Fe	28	Antimony (Stibium)	Sb	122
Zinc	Zn	32·5	Arsenic	As	75
Cerium	Ce	46	Mercury (Hydrargyrum)	Hg	100
Chromium	Cr	26·25			
Copper (Cuprum)	Cu	31·75	Silver (Argentum)	Ag	108
Bismuth	Bi	210	Gold (Aurum)	Au	196·5
Lead (Plumbum)	Pb	103·5	Platinum	Pt	98·5
Tin (Stannum)	Sn	59			

According to the new system of notation, the elementary numbers or equivalents of the following simple bodies are exactly double what are stated in the above table—*i.e.*, Oxygen, Carbon, Sulphur, Barium, Calcium, Magnesium, Aluminum, Manganese, Iron, Zinc, Cerium, Chromium, Copper, Lead, Tin, Cadmium, Mercury, and Platinum. The equivalents of the following remain as they were —Hydrogen, Nitrogen, Chlorine, Iodine, Bromine, Phosphorus, Boron, Potassium, Sodium, Lithium, Bismuth, Antimony, Arsenic, Silver, and Gold. (See Table in Appendix.)

As some names occur very frequently, especially under the head of Tests, it is sometimes found convenient to make use of abbreviations, independent of the Symbols, and without reference to the composition of a body. Also for the British Pharmacopœia, the letter B., and L., E., D., where it may be necessary to mention the old Pharmacopœias of London, Edinburgh, or Dublin.

Water	Aq.	Oxalic Acid	O′ or Ox′
Distilled Water.	Aq. dest.	Acetic ,, . .	A′ or Acet′
Sulphuric Acid .	S′ or Sul′	Nitric ,, ...	N′ or Nitr′
Carbonic ,, .	C′ or Carb′	Muriatic′ ,, ...	M′ or Mur′
Phosphoric ,, .	P′ or Phosp′	Tartaric ,, ...	T′ or Tar′
Citric ,, .	Cit′	Sulphuretted Hydrogen	Sulph. Hydr.
Potassa . . .	P. or Pot.	Ammonia	Am.
Soda	So.	Cyanogen	Cyan.
Chloride of Barium . . .	Cl. Ba.	Hydrocyanic Acid . .	Hydrocy′
Nitrate of Silver	Nitr. Arg.	Ferrocyanide of Potassium	Ferrocy.Pot.

The above Symbols not only indicate their respective Elementary substances, but when alone, always stand for 1 Eq. of that Element. To indicate more than 1 Eq., numerals are added to the Symbols, as 2C, 3C, or O_2, O_3, O_4, &c. As these elements combine together, and form compounds always constant in nature, the composition of these is indicated by the juxtaposition of Symbols, or by placing the + sign between them, as $H\,O$ or $H+O$, indicating 1 Eq. of Hydrogen combined with 1 Eq. of Oxygen, as in water. Numerals are added if more than 1 Eq. be present, as C2O or $C\,O_2$, indicating that 1 Eq. of Carbon is combined with 2 of Oxygen, as in Carbonic acid. Each compound has its own Eq. number, which is made up of the sum of those of its components. Thus $H\,O=1+8=9$, or the sum of the Eq. numbers of Hydrogen and Oxygen. So $C\,O_2=22$, because 1 Eq. of Carbon, 6, is added to 2 Eq. of Oxygen, $8\times 2=16$. Here it may be seen that the Eq. number of Oxygen is the same in both cases, as it is indeed in all others, because these elements always combine together in the same relative proportions. This is the case also with the compounds, of which the Eq. number is always the same, and which are subject to the same law of definite proportions as the elements. Their composition is expressed in the same way. Thus, $H\,O+S\,O_3$, or $H\,O$, $S\,O_3$, means, in either case, 1 Eq. of Water combined with 1 Eq. of Sulphuric acid, a compound formed of 3 Eq. of Oxygen with 1 of Sulphur, having as its Eq. No. $9+(8\times 3+16)=49$.* When a large figure is printed before a symbol, it multiplies every symbol to the next comma, or to the next sign +, or all placed within brackets. When the Equivalent proportions of a compound are unknown, or when it is wished to state the percentage of the components of a known body, the following method is adopted: thus—

Wax is stated to be composed of

Carbon	81·874
Hydrogen	12·672
Oxygen	5·454
	100·

And Carbonate of Magnesia of

Magnesia	41·6
Carbonic Acid	36·0
Water	22·4
	100·

Besides combining in equivalent weights, substances have, when in a gaseous state, a certain relation to each other with respect to their bulk, and combine in certain proportions, that is, one measure or volume with one or more volumes of another gas. The resulting measure of the compound gas is either equal to the sums of the volumes of its components, or, in consequence of chemical union, it is condensed into a smaller compass, which, however, bears to the former a certain ratio. This, therefore, requires to be noticed in an account of a gas.

By taking advantage of the tendency of bodies to combine, and of the power of others to decompose them, are obtained the different Chemical preparations of Pharmacy. Thus by the mere process of Torrefaction or Roasting, some of the volatile parts of a body are expelled, while others undergo a change, or Oxygen is absorbed. This process, therefore, closely resembles Oxygenation, where Oxygen is induced to combine with other substances, either by exposing them to the influence of pure Oxygen, or to that in the atmosphere, or by acting on them with a body, as Nitric acid, containing much Oxygen (cohobation). Deflagration takes place when a metallic body is ignited with a Nitrate, when the Nitric′ yields its Oxygen, and the metal is oxidised. The process is the converse of Reduction, where whatever is combined with a metal, as Sulphur or Oxygen, is driven off by heat, this result being sometimes assisted by the presence of a flux. Such a proceeding is called Calcination, when, instead of a simple metal, a base or oxide is left behind. By different methods of Decomposition, various acids are obtained from their salts. They are distinguished into Oxygen acids, as the Nitric, Acetic, &c., and Hydrogen acids, as Hydrochloric and Hydrocyanic. So the alkalies and other bases are obtained by the decomposition of their salts, as *e.g.* solution of Potash. The various salts may be formed by bring-

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* In these instances the equivalents of the elements are in whole numbers. When decimal fractions are in question, the calculations of the equivalent number of the compound is more difficult.

ing together the acids and bases, whether the latter be alkaline, earthy, or metallic oxides, in the requisite proportions, and ascertaining the saturation of neutral salts by means of Litmus or Turmeric paper. Some of the elementary substances, when in the same manner combined, form compounds, which are called, from resemblance in nature to common salt (*ἅλες*), *haloid* salts. Such are Chlorides, Iodides, and Bromides of metals. When an atom of water is present, such a compound cannot be distinguished from a Hydrochlorate, Hydriodate, or Hydrobromate, and thus comes naturally under the category of *Salts:* thus

$$\mathrm{K\,Cl + H\,O = K\,O,\ H\,Cl.}$$

For forming these compounds the law of definite proportions is of great value, as it informs us of the exact quantities of each substance to be employed, because the equivalent numbers indicate not only the proportion in which one body combines with another, but also that in which it will combine with every other. So if two neutral salts are mixed together, and mutually decompose each other, the results will also be two neutral salts, &c. Finally, the processes of Fermentation yield us our different Spirits, Wines, and Vinegars, as will be explained under their respective heads,—and under Etherification, the effects of acids on Alcohol.

MANUAL OF MATERIA MEDICA.

PART FIRST.

INORGANIC KINGDOM.

MINERAL AND CHEMICAL SUBSTANCES.

SEEING that Bodies are either Simple or Compound, and that the latter may be analysed, or the former united, it is obvious that the study of natural substances may be commenced either with the simple elementary bodies, proceeding thence to the compounds ; or some one of the latter with which we are well acquainted may be taken and separated into its ultimate principles, and these studied before proceeding to others. There are two bodies with the appearance of which all are well acquainted, and which, though apparently elementary, are now well known to be compound bodies. These are Atmospheric Air and Water, the nature and composition of both of which require to be studied before many of the processes for preparing articles of the Materia Medica can be understood.

ATMOSPHERIC AIR.

F. Air Atmospherique. *G.* Atmosphärische Luft.

The Atmosphere, which everywhere surrounds the globe, extends to a height of 45 miles. It is an invisible gaseous body, devoid of odour and of taste, compressible, easily expanded by heat. Its Sp. Gr., according to the experiments of Sir G. Shuckburgh, is ·001208 at 60° Fahr., and the Barometrical pressure of 30°, water being taken as a standard. But being usually taken itself as the standard of comparison for gases, it is then reckoned=1. 100 Cubic Inches weigh 31·0117 grains, and its pressure at the level of the Sea is equal to 15 pounds upon each square inch of surface, or a column of air one inch square, and extending to the limits of the Atmosphere, weigh about 15 pounds, or the same as a column of Mercury, also one inch square, but only 30 inches high, which it is thus able to balance and support by the pressure of its weight. This weight must necessarily vary at great depths, as well as at great heights, as a greater or less mass of air will be superimposed. Hence the Barometer is employed for measuring heights, a diminution of one inch being found equal to about 1000 (922) feet. From being compressible, its density necessarily varies at different heights, the inferior strata being dense, and the upper ones rarefied. The temperature also diminishes as we ascend into the atmosphere, at the rate of 1° F. for every 100 yards, or, more correctly, for every 352 feet.

Though apparently simple in composition, it is actually composed of two very distinct gaseous bodies, Oxygen and Nitrogen, and a small portion of Carbonic acid gas. The proportions in which these exist, are, in 100 parts:

Nitrogen gas	77·5 by measure,	75·55 by weight.
Oxygen gas	21 "	23·32 "
Aqueous vapour	1·42 "	1·03 "
Carbonic Acid gas	·08 "	·10 "

Omitting the aqueous vapour, which is variable in quantity, sometimes amounting, in hot countries, to as much as 2 per cent., the proportions of the permanent gases are stated by Humboldt, from experiments by himself and Gay-Lussac, to be:

Nitrogen gas . . .	0·787 by measure,
Oxygen gas . . .	0·210 "
Carbonic Acid gas . .	0·003 "

or, omitting the Carbonic Acid gas, 77 by weight of Nitrogen, with 23 of Oxygen, or by volume 79·2 of the former and 20·8 of the latter in 100 parts.

Air in certain conditions contains minute quantities of *Ozone*, which is a modification, or peculiarly active form, of Oxygen gas.

The presence of Ammonia in small quantities has been detected by Liebig; and some Nitric acid is found after thunderstorms. It has been imagined that some Hydrogen gas may exist in atmospheric air; and Hydrochloric acid is said by some, Iodine by others, to have been detected in it at the sea-shore.

Dr Murray has observed that the Atmosphere may be regarded as a collection of all those substances which are capable of existing at natural temperatures in the aërial form, and which are disengaged by the processes carrying on at the surface of the earth. These, with other substances, as watery vapour, the effluvia from animals and vegetables, independent of Heat, Light, and Electric fluid, form a vast mixture, the composition of which it is not possible to determine with perfect accuracy.

Chemical Analysis has, however, proved that the various substances which may be mixed with the atmosphere quickly disappear, and are not to be detected by Chemical Tests, and that the composition of the air is everywhere nearly uniform. It must, however, be noticed, that in very crowded assemblies of people, and in close apartments, where there is a want of circulation, the quantity of Carbonic acid gas is a good deal increased. It was at one time supposed that the constituents of the Atmosphere were retained by Chemical Attraction. Dalton, however, promulgated the opinion that they were mechanically mixed; that the particles of the *same* gases repel, but that the particles of *different* gases do not repel, one another: and that thus one gas acting as a vacuum to another, and each being repelled by its own particles, they become diffused. Professor Graham has ascertained that each gas has a diffusive power, or *Diffusiveness*, peculiar to itself, which is inversely proportional to the square root of its density, and by which it tends to mix with other gases.

The properties of Atmospheric air are a mean of those of its constituents, and its chemical actions are due to the oxygen; by this it is enabled to support combustion; also the respiration of animals, a portion of it being by them converted into Carbonic acid. Fishes depend upon its presence in the water, though this dissolves only a small portion of air, but more of its Oxygen than of its Nitrogen. The processes of vegetation are also dependent upon the atmosphere, as it conveys water and also Carbonic acid to the leaves of plants, where the Carbon becomes fixed, and the Oxygen again set free; and thus plants contribute to purify the air which might become deteriorated by the respiration of animals. As the atmosphere varies in the quantity of moisture it contains, so it assists in the distribution of water over the surface of the globe, and is, by its mobility, the principal agent by which the extremes of temperature are moderated. According to the temperature and moisture of the atmosphere, so is the rate of evaporation, and consequently of perspiration. Hence not only do many pharmaceutical operations require a knowledge of the constitution of the atmosphere, but some of the functions of the body must be influenced by its different states, and the action of some classes of medicines modified by its different degrees of density and of dryness.

OXYGEN.

Oxygen. *Vital Air.* *F.* Oxygène. *G.* Sauerstoff.

Oxygen (Symb. O Eq. N 8) was named by the French chemists from *οξυς*, *acid*, and *γενναω*, *I generate*, having been supposed by Lavoisier to be the only generator of acids. It was not discovered until 1744 by Priestley, though it is the most extensively diffused body in nature. It forms one-fifth by weight of the atmosphere, eight-ninths by weight of water, and probably not less than one-third of the solid crust of the globe; for Silica, Alumina, and Carbonate of Lime contain nearly one-half of their weight of Oxygen. It forms, moreover, one of the constituents of both animal and vegetable bodies.

Prop.—Oxygen is a permanent colourless gas, devoid of odour and of taste. It is somewhat heavier than common air, as, at a temperature of 60° F. and a barometrical pressure of 30 inches, 100 Cubic Inches weigh 34·25 grains; it is sixteen times heavier than an equal bulk of Hydrogen gas. Its Sp. Gr. is 1·111. 100 volumes of water dissolve 3·5 of the gas, but by pressure water may be made to take up much more of the gas. (Aqua Oxygenii or Oxygen Water.) Oxygen has most extensive affinities, combining with every other known elementary body, except Fluorine. The bodies which are thus formed vary much in their properties. Some of them are called oxides, others alkalies, both of which, however, are called bases, and combine with a third set, possessed of very different properties, and which are called Acids, or Oxygen acids. Some bodies combine slowly with Oxygen, others with great vehemence, and with the evolution of light and heat, as in the combustion of bodies in the air, but the brilliancy of which is much increased if taking place in Oxygen gas. The respiration of animals is, in fact, a kind of combustion; the Oxygen of the air combines with the Carbon of the blood, and is expelled in the form of Carbonic gas. But vehemence of action is moderated by its being diluted with four-fifths of Nitrogen gas in the air. A gas with a peculiar smell, given off from the positive pole of the Electrical machine during its action, has been named *Ozone* by Professor Schönbein; but Faraday has shown that it is probably a peculiar modification of Oxygen, the combining affinity of which is much stronger than that of the gas as commonly met with. By supposing its generation, it may be possible to explain the agency of light in the process of bleaching, and of the electricity in a thunderstorm in the production of Nitric acid from the Oxygen and Nitrogen of the atmosphere. The properties of Oxygen require to be well understood, both with reference to the functions of life and the mode of action and preparation of many medicines.

Prep.—Heat powdered and dried *black oxide of Manganese* in an iron gas bottle, till it is red hot; collect the gas. 1 lb. should yield from 40 to 50 pint measures. Or mix *black ox. Mangan.* and *Sul'* to the consistence of cream, and distil in a glass retort. Or the *red oxide of Mercury* or *Nitre* may be heated to dull redness to obtain this gas. 100 grs. *Chlorate of Potash*, heated in a retort or tube, yield 100 C. I. of very pure Oxygen.

Tests.—A rough test of the purity of this gas is, introducing into it a *glowing* taper: if the gas be pure, the taper will immediately burst into a flame.

Action. Uses.—Oxygen gas is stimulant when inhaled, and has hence been used, diluted with common air, in asphyxia, &c. Oxygen Water is a moderate stimulant, and may be given to the extent of a bottle or two daily.

NITROGEN.

Nitrogen. *Azote.* *F.* Azote. Nitrogène. *G.* Stickstoff.

Nitrogen (N=14), the other constituent of the Atmosphere, was so called from being considered the producer of Nitre or of Nitrates. It was discovered in 1772 by Rutherford. Its properties may be considered the reverse of those of Oxygen, as it will not support combustion nor the respiration of animals. In fact, it is fatal to them, but chiefly on account of the absence of Oxygen. It is often called Azote, from α, *privative*, and ζωή, *life*. It is abundantly diffused, as it forms four-fifths of the atmosphere. Its chief use seems to be, to dilute the oxygen, though it no doubt also performs some more important functions. It exists also in small quantity in the Ammonia of the atmosphere, also in the Nitric acid which is found in it after thunderstorms. It forms a constituent of all animal bodies, and likewise of many vegetable products which form the food of animals.

Prop.—Nitrogen in its simple state is best described by negatives, as it is devoid of colour, and is without taste or smell. It cannot support combustion, neither can it sustain respiration, and it is nearly insoluble in water. It is lighter than common air. Sp. Gr.$=$·975 ; 100 Cubic Inches weigh 30·15 grains. It forms, however, numerous compounds with other elements, many of which are possessed of very active properties : *see* Nitric acid, Ammonia, &c.

Prep.—Nitrogen may be obtained by burning *Phosphorus* carefully in a jar of common air, when the whole of the Oxygen being abstracted, the Nitrogen is left comparatively pure. Or a mixture of *Sulphur* and *Iron filings* made into a paste with water, and similarly enclosed, will slowly absorb the Oxygen. It may then be further purified by passing it through Sulphuric acid to separate the water and Ammonia of the atmosphere, and then through lime water to abstract Carbonic acid.

Action. Uses.—Nitrogen gas, being devoid of active properties, has been proposed to be employed in still further diluting common air in cases of excitement of the respiratory organs. Substances abounding in Nitrogen are the most nourishing as food.

HYDROGEN.

F. Hydrogène. *G.* Wasserstoff.

Hydrogen ($H=1$), from ὑδωρ, *water*, and γεννάω, *I generate*, does not exist free in nature, but combined is a constituent of water, of some acids, gases, and all vegetable matter. It was first correctly described in 1766 by Cavendish. It has hitherto been undecomposed, but several chemists entertain the view that its base is analogous to a metal.

Prop.—At common temperatures an invisible permanent gas, devoid of odour or taste ; by exposure to intense cold, Faraday could not liquefy it. It is 14·4 times lighter than air, and its Sp. Gr.$=$·0693. 100 C. I. weigh 2·14 grains. Water dissolves 1½ per cent. of its bulk of Hydrogen. When a lighted taper is brought in contact with the gas, it inflames, and burns with a pale yellow flame, uniting with the Oxygen of the air, and forming water. These gases, when mixed, do not unite until they are inflamed. Hydrogen, being the lightest body known, is assumed as the standard with which the equivalent numbers of other bodies are compared : its Eq. therefore is 1. But when Oxygen$=100$ is taken as the standard of comparison, $H=12·5$. It is interesting to us chiefly as being a constituent of Water, of Hydrocarbons, of Hydrochloric and Hydrocyanic acids, also of all vegetable and most animal substances.

OXYGEN AND HYDROGEN.

WATER. Aqua. Distilled Water. Aqua Destillata. *F.* Eau. *G.* Wasser.

Water (Aq. or $H\,O=9$), like the Air, is so universally diffused and well known, as not to require to be described. When pure it is colourless, and devoid of both taste and smell; but it may contain many impurities without these properties being sensibly impaired; therefore, for Chemical and Pharmaceutical purposes Distilled water should be employed.

Like Air, Water contains Oxygen, but it differs in being a strictly chemical compound. The other element is Hydrogen. One Equivalent of Oxygen, 8, is combined with one Eq. of Hydrogen, 1, making 9, the Equivalent number of water; which, therefore, or some multiple of it, is added to the equivalent number of chemical compounds when water is in combination. From its ready accessibility, water has been assumed as the standard of comparison for Specific Gravities. Its Sp. Gr. is therefore represented by 1, or 1000, as may be thought most convenient. Water, it is well known, freezes at 32° of Fahrenheit's thermometer, but attains its greatest density at 40°, expanding at a lower temperature; therefore, ice readily floats upon water. It boils at 212°, and is then converted into steam, of which the Sp. Gr. is ·625 at 212° F., when it has the greatest density, and is composed of one volume of Oxygen combined with two volumes of Hydrogen. One volume of water will form about 1700 volumes of steam, and in the production of the latter 1000 degrees of heat become latent, the sensible heat of steam not exceeding the boiling heat of water. But water passes at all temperatures into the air by spontaneous evaporation, and causes its greater or less moisture or dryness. It enters into intimate combination with various bodies, which are then called Hydrates (from ὕδωρ, *water*), as in the cases of Lime and Potash, the Hydras Calcis and Hydras Potassæ; so also in some Liquids, as Sulphuric acid, and in Nitric acid, and in a variety of crystals; from these, however, a great proportion of water may be expelled by heat, and from some by mere exposure to the air. It forms a large proportion of most organised bodies, and dissolves a great variety of solid substances, and usually in increased proportion as its temperature is increased. It likewise dissolves many of the Gases, some, as Common Air, Oxygen, and Carbonic acid gas, in small proportion; but others, as Ammoniacal and Hydrochloric acid gases, in immense quantities.

From the great solvent powers of water, it is seldom met with in a pure state. Rain water, even, contains some Carbonate of Ammonia or of Lime, which was floating in the atmosphere, and usually about 3½ cubic inches of common air in 100 cubic inches of water. Spring water generally contains Carbonate and Sulphate of Lime and Chloride of Sodium, besides the usual proportion of air, and often Carbonic acid. Well water, obtained by digging, usually contains a large proportion of salts, and is often called *hard* water, because it curdles soap by decomposing it. River water, though proceeding from springs, deposits upon exposure to the air many of the salts it contained, and is hence called *soft* water, because soap readily mixes with it. It is found that water containing a certain proportion of salts is less likely to become deteriorated by contact with leaden pipes or cisterns than a purer water would be. Some Spring waters contain so large a proportion of impurities as to be called Mineral waters. They are arranged under the heads of Carbonated, Sulphuretted, Saline, and Chalybeate mineral waters. (See Table at close of this work.) Sea water contains a still larger proportion of salts, especially common salt, with the Chloride of Magnesium and Sulphate of Magnesia.

Water necessarily commands a considerable share of attention, as it forms a portion of the aliment of both vegetables and animals; and from its great solvent powers it is an important agency in Pharmacy, as with it are formed various aqueous solutions, Distilled waters, Infusions, Decoctions, and it is employed to dilute Acids, Alkalies, and Spirits. It is useful also in some processes by becoming decomposed, when its Oxygen serves to oxidise different bodies, and its Hydrogen escapes in the form of gas. For Chemical and for most Pharmaceutical operations Distilled water (the Aqua Destillata of the Pharmacopœia) is required to be employed.

As an example of the amount of impurity in the different kinds of water supplied to the inhabitants of towns, we may quote a report of Dr Dundas Thomson, Medical Officer of Health in the parish of St Marylebone, London. In the water of a well in the parish, he found 17½ grains of organic impurity in the gallon, 87 grains of inorganic impurity; total, 104½ grains. In the water of the river Thames 3⅓ organic, and 16½ inorganic matter; total, about 20 grains. In the water of Loch Katrine, supplied to the inhabitants of Glasgow, there was about ¾ grain of organic, 1½ inorganic; total impurity, 2¼ grains in the gallon.

As a Therapeutical agent, water plays an important part, as it is often the best medium for applying either heat or cold to the body; and as it forms so large a portion of the blood, it is a chief means for increasing its fluidity, facilitating circulation, diluting secretions, and rendering them less acrid. It will act also as a solvent of many solid substances, as it passes through the system, and forms the principal part of Diluent and Demulcent Remedies.

SULPHUR.

Sulphur. *Brimstone*. *F.* Soufre. *G.* Schwefel.

Sulphur (S=16), from *Sal*, salt, and πυρ, *fire;* was employed in medicine by the Greeks, Arabs, and Hindoos. It occurs in many animal substances, as Albumen in eggs, &c., in some plants, as in Cruciferæ, Umbelliferæ, Garlic, Fungi, &c., and in the mineral kingdom; also combined, as in gases or salts, in some minerals, and in mineral waters. It is frequently found in combination with metals, as in the common ores called Pyrites—the Sulphurets of Iron, of

Copper, Lead, Mercury, &c., whence it is obtained by roasting, in Germany, Sweden, and this country ; part of the Sulphur is burnt into Sulphurous acid, another part, being volatilised without change, is collected in chambers. Native or Virgin Sulphur uncombined, is either a volcanic product, or occurs in beds in many parts of the world ; that of commerce is brought chiefly from Italy, Sicily, and the adjacent islands. In 1853 nearly 1000 cwts. of rough Sulphur were imported. It is afterwards purified by fusion, distillation, and sublimation, hence known under the names of Stick, Roll, Sublimed, and Flowers of Sulphur. Native Sulphur is purified by distilling it from earthen pots arranged in two rows in a large furnace. The Sulphur fuses and sublimes, and passes through a lateral tube in each pot into another placed on the outside of the furnace, which is perforated near the bottom, to allow the melted Sulphur to flow into a pail containing water, where it congeals and forms *rough* or *crude* sulphur. This being redistilled, forms refined sulphur. When fused and cast into moulds, it forms *stick* or *roll* sulphur.

Prop.—An opaque brittle solid, crystallising in acute octohedrons with an oblique base at temperatures below 232°, as from a solution of Sulphuret of Carbon, but when cooled gradually after fusion it assumes the form of an oblique rhombic prism. Thus it is dimorphous. Fracture shining, crystalline. Sp. Gr. 1·98 ; when free from air-bubbles, 2·080 ; that of the vapour is between 6·51 and 6·9. The colour in the solid state, when pure, is pale yellow ; but it often varies from lemon-yellow, through green, dark yellow, and brown-yellow, according to the degree of heat to which it has been subjected. Taste insipid ; odour generally none ; acquires a faint and peculiar smell when rubbed. When grasped in the hand it cracks : roll sulphur feels greasy to the touch. Sulphur has no action on vegetable colours. It is insoluble in water, slightly soluble in alcohol, especially when finely divided, or when the two are brought together in a state of vapour ; in the same manner it is soluble in Sul. Ether, in Oil of Turpentine, and in most fat and essential Oils, also in alkaline solutions, petroleum, &c. It is inflammable ; when heated to about 300° in the open air, it takes fire, and burns with a pale blue, and at higher temperatures a purple flame. It is a non-conductor of heat ; when heated to about 180° it begins to volatilise, to fuse about 216° ; between 226° and 280° it becomes perfectly liquid, and of a bright amber colour ; about 320° it begins to thicken, and becomes of a reddish colour, and so viscid, that the vessel may be inverted without its running out. If in this state it is poured into water, it remains soft like wax for some time, and has been used for taking impressions of seals, &c. ; it may then be drawn into threads, which are elastic. From 482° to its boiling point, 600°, it becomes more fluid, and at that point, if air be excluded, sublimes unchanged as an orange vapour. On cooling, it passes again through the same transitions ; if slowly cooled, it forms a crystalline mass, or frequently retains its fluidity till touched by a solid body. (Mitscherlich, Magnus, and Berthelot have shown that sulphurs exist in several conditions, more or less crystallisable, and varying in their degree of solubility in liquid Bisulphuret of Carbon.)

Sulphur is an elementary body, though it so often contains traces of Hydrogen that it was at one time thought to be a compound of that gas. It is exceedingly important as a chemical agent, forming Sulphurets (also called Sulphides) with the various metals; with Oxygen it forms acids, of which the Sulphurous and Sulphuric are the chief; with Hydrogen, Hydrosulphuric acid, or Sulphuretted Hydrogen. It undergoes no alteration in the air at common temperatures. That of commerce, when obtained from Pyrites, may contain metallic impurities, as Zinc (Carbonate and Sulphate), Iron (Oxide and Sulphuret), Arsenic (the Sulphuret), Silica, Magnesia, Alumina, and Carbonate of Lime. Flowers of Sulphur are sometimes contaminated by the presence of a minute quantity of Sulphurous (stated by some to be Sulphuric) acid, formed by a portion of the Sulphur during sublimation uniting with the Oxygen in the apparatus. It should be freed from acidity by washing with hot water, after which it should not affect Litmus paper.

Tests.—Known by its colour, fusibility, volatility, burning with a blue flame, and the evolution of the pungent vapours of Sulphurous acid gas formed during its combustion. It should completely evaporate when heated to 600°, and be perfectly soluble in boiling Oil of Turpentine. It should have no action on Litmus. If fused with Carbonate of Soda, and tested with a drop of the solution of Dr Playfair's Nitroprusside of Soda, a beautiful purple is produced.

SULPHUR SUBLIMATUM, B. Sublimed Sulphur.

Prepared by reducing Sulphur to a coarse power, and then subliming from a large iron retort into a sulphur-room, where the vapour is immediately condensed. Purified by washing till the water ceases to have an acid taste. Pulverulent, but when examined under a microscope, seen to be composed of small granular masses.

Prop.—Its characters are those of Sulphur.

Tests.—Evaporates totally at a temperature of 600°. Agitated with Aq. Dest., it has no action on Litmus. Heated with Nit′, the solution diluted with water, neutralised with Carb. of Soda, and acidulated with Mur′, should not yield a yellow precipitate with Sulphuretted Hydrogen,—showing the absence of Arsenic. "Sol. of Ammonia, agitated with it and filtered, does not, on evaporation, leave any residue." (Test for $S\ O_3$). See *Sulphur.*

SULPHUR PRÆCIPITATUM, B. Precipitated Sulphur. *Lac Sulphuris*, or *Milk of Sulphur.*

Prep.—B. Heat *sublimed Sulphur*, ℥v., previously well mixed with *slaked Lime*, ʒiij., in a pint of water, stirring diligently with a wooden spatula, boil for fifteen minutes, and filter. Boil the mixture again in half a pint of water, and filter. Let the united filtrates cool, dilute with two pints of water, and, in an open place and under a chimney, add in successive quantities *Hydrochloric Acid*, ʒviij., or a sufficiency, previously diluted with a pint of water, until effervescence ceases and the mixture acquires an acid reaction. Allow the precipitate to settle, decant supernatant liquid, pour on fresh distilled water, and continue purification by washing and subsidence until the fluid ceases to have an acid reaction, or to precipitate solution of oxalate ammonia. Collect the precipitated sulphur on a calico filter, wash it once with distilled water, and dry at a temperature not exceeding 120°.

This preparation has been nearly out of use of late years on account of two-thirds by weight of that sold in the shops having consisted of sulphate of lime. Prepared as above it is a very pure form of sulphur, and the best for internal use.

To the solution produced, which contains Sulphuret of Calcium and Hyposulphite of Lime, Hydrochloric acid is added in sufficient quantity to form with the Lime Chloride of Calcium, and Sulphur is precipitated. Sulphuric acid may be fraudulently substituted for Hydrochloric, when Sulphate of Lime falls down along with the Sulphur.

It is very similar in most of its properties to sublimed Sulphur, but is whiter. It contains a little water. Impurities may easily be detected by heat, which will cause the Sulphur to evaporate, when the Sulphate of Lime will be left behind; or by the microscope, by which the crystals of the latter are seen.

Precipitated Sulphur is smooth and white, and seems to hold a little water in combination with it. It consists of microscopic granules smaller than those of sublimed Sulphur.

OLEUM SULPHURATUM. Sulphurated Oil. *Balsamum Sulphuris. Balsam of Sulphur.*—It is now omitted from the Pharmacopœias. It was obtained by boiling Sulphur and Olive Oil, stirred together in a large iron vessel, until they gradually united. It is a dark reddish-brown viscid substance, having a very disagreeable smell.

Action and Uses of Sulphur.—In small doses given internally, Sulphur is Diaphoretic and Alterative. It is apt to combine in the system both with Oxygen and Hydrogen, passing off into the urine in the form of Sulphuric acid, and communicating to the sweat the odour of Sulphuretted Hydrogen. It is given as an Alterative in Gout and Rheumatism, but is of most use in various chronic skin diseases, especially Impetigo and Scabies. In these complaints it may likewise be employed externally, in the form of ointment. Some have supposed that this application may cure Scabies by killing the minute Acarus which is associated with that eruption. In large doses Sulphur operates as a laxative Cathartic. It is usually mild in action. It may be given alone, or in combination with other laxatives, in hæmorrhoidal complaints, or to children.

Dose.—Gr. v. and gr. x.–gr. xx. two or three times a-day as an alterative; gr. xx.–gr. clxxx. as a laxative.

UNGUENTUM SULPHURIS, B. Sulphur or Brimstone Ointment.

Prep.—B. Mix thoroughly *Sublimed Sulphur*, ℥j., with *Benzoated Lard*, ℥iv.

Action. Uses.—Alterative, chiefly applied in Scabies and other skin diseases. Only three-fifths as strong as Ung. Sulph. L.

Confectio Sulphuris, B. Confection of Sulphur.

Prep.—B. Take of *Sublimed Sulphur*, ℥iv.; *Acid Tartrate of Potash*, ℥j.; *Syrup of Orange peel*, ℥iv. Rub well together. A useful laxative Cathartic. *d.* ʒj.–ʒij.

Sulphur is also contained in Emplastrum Hydrargyri, and Emp. Ammoniaci et Hydrargyri.

Sulphur and Oxygen.

Acidum Sulphuricum. Sulphuric Acid. *F.* Acide Sulphurique. *G.* Schwefelsaure.

Sulphuric Acid ($S\,O_3 = 40$) is one of the most important compounds of Chemistry. This acid is produced in small quantities in nature, as near volcanoes, in some acid springs, and exists in combination in numerous Sulphates, especially those of Lime (*Gypsum*) and of Magnesia, found as minerals, or in the water of springs. It was known to the Arabs, Persians, and Hindoos.

Sulphuric acid appears, from its names, to have been originally made in Europe, and probably also in Persia, from the decomposition of Vitriol or Sulphate of Iron, a practice still followed at Nordhausen in Saxony. The Sulphate is first calcined, so as to expel nearly the whole of the water (of crystallisation) it contains. The acid, distilled off in an earthenware retort at a red heat, comes over in vapours, which condense into a dark-coloured oily-looking liquid. This fumes when exposed to the air, and contains less than 1 Eq. of Water to 2 of Sulphuric acid, has a Sp. Gr. of 1·9, and is known in commerce as the Nordhausen, Fuming, or Glacial Sulphuric acid.

Prop.—Sul′ may be obtained in a free or anhydrous state by carefully heating the Nordhausen Acid obtained from Sulphate of Iron in a retort, and condensing its vapours in a bottle artificially cooled. It then forms a white solid, fibrous-like Asbestos, with some fine acicular crystals. At 66° it becomes liquid, and boils at 122°. Sp. Gr. 1·97. The dry acid does not redden Litmus; when exposed to the air, dense white fumes are produced, from its condensing atmospheric moisture. It will combine with Water with explosive violence.

Acidum Sulphuricum, B. Monohydrated Sulphuric Acid. Oil of Vitriol. *Vitriolic Acid. Spirit of Vitriol.*

Prop.—Liquid Sulphuric′ ($S\,O_3\,H\,O = 49$) is a dense oily-looking liquid, usually colourless, devoid of smell, but intensely acid, and powerfully corrosive. At first it feels oily, from destroying the cuticle, but soon acts as a caustic, charring both animal and vegetable substances by combining with the water and setting free the carbon. It freezes at from – 15° to – 29°, according to its density, and boils at 620° F. Its affinity for water is great, heat and condensation being produced on their union. It absorbs moisture from the atmosphere, $\frac{1}{3}$ of its weight in 24 hours, and 6 times its weight in a twelvemonth, and consequently becomes weaker the longer it is exposed.

Professor Graham has found that S′ combines with water in several definite proportions. It may be diluted with it to any extent. It unites with alkalies, earths, and metallic oxides, rapidly dissolving some metals, as Iron and Zinc, when diluted with water. By the action of S′ on alcohol, Ether is produced. Several substances, as Charcoal, Phosphorus, Copper filings, &c., when heated with S′ decompose it, by abstracting its Oxygen, and evolving Sulphurous acid.

Prep.—Until recently, Sulphuric acid was manufactured in this country by burning Sulphur along with Nitre.

This process is now improved upon. Sulphurous acid gas, Nitric acid vapour, and steam, are simultaneously admitted, by a proper arrangement of pipes, into oblong leaden chambers containing water at the bottom. The Sulphurous acid is obtained by burning the Sulphur in a proper furnace. Sulphur in burning unites with 2 Eq. of Oxygen, to form $S\,O_2$. The Nitric acid vapour is produced separately by heating Nitre (Nitrate of Potash) with Sulphuric acid in an iron pot. The latter combines with the Potash, forming a Sulphate, and the Nitric acid ($N\,O_5$) is set free. The quantity of Nitre used is about $\frac{1}{12}$ of the Sulphur burnt. Steam, produced by a boiler, is caused to encounter these two acid gases where they meet in the leaden chamber. This chamber is long, and intersected by partitions which nearly reach the bottom, in order that the vapours may pass through it slowly, and have thus more time to react upon each other.

The reaction is simple. The Nitric acid gives up one equivalent, or a fifth part of its Oxygen, forming the Sulphurous into Sulphuric acid, and itself becoming Nitrous acid—

$$S\,O_2 + N\,O_5 = S\,O_3 + N\,O_4.$$

The Sulphuric Acid thus formed is dissolved by the water at the bottom of the chamber.

Peligot states that the $N\,O_4$ is next converted by water into Nitric and Hyponitrous acids; that the latter ($N\,O_3$), along with more water, forms more Nitric acid, and Binoxide of Nitrogen ($N\,O_2$); that this last, being gaseous, combines in the air with 2 Eq. of Oxygen, forming Nitrous acid, which then again goes through the same round of changes. By each of them Nitric acid is formed, which, according to Peligot, is the sole agent in the oxidation of the $S\,O_2$.

When there is a deficiency of steam in the air of the chamber, a curious crystalline substance is apt to form, which is thought to be a compound of Sulphuric acid with Binoxide of Nitrogen.

The water at the bottom of the chamber becomes gradually converted into liquid Sulphuric acid of considerable strength. When the S′ thus made has a Sp. Gr. of 1·5 (1·6 Gr.), it is drawn off, and is usually first conveyed to shallow leaden pans, where it is concentrated to a Sp. Gr. 1·70, or until it would act upon the lead. It is then further boiled down in platinum retorts, until it has a Sp. Gr. of 1·84 ; when cooled, it is removed into larger carboys, and forms the *Oil of Vitriol* of commerce. (Before being used for any purpose, this acid should be tested for Arsenic by Marsh's test, and for Nitrous acid by the iron test.) S′, in its most concentrated state, is a definite compound of 1 Eq. Acid and 1 Eq. of Water, which last cannot be separated by heat, as the acid and water distil over as a hydrate.

Tests.—The presence of S′, or of the soluble Sulphates, is easily ascertained by a solution of Chloride of Barium, or of the Nitrate of Baryta, as they form a white precipitate of Sulphate of Baryta, which is insoluble in either acids or alkalies. S′ should be colourless; Sp. Gr. 1·843. (The B. P. of 1864 used a stronger acid, of Sp. Gr. 1·846.) Distilled to dryness should leave scarcely any residue. Diluted S′ should not be coloured by Hydrosulphuric′. Its want of colour indicates the absence of organic matter. Mr Phillips states that the acid of Sp. Gr. 1·843 consists of 4 equivalents of the anhydrous Acid to 5 of Water. "It contains 96·8 by weight of SO_3, HO, and 79 per cent. of anhydrous SO_3," B. P. 50·6 *gr. by weight mixed with* 1 *oz. of distilled water require for neutralisation* 1000 *grain measures of the volumetric Sol. Soda.* When a solution of Sulphate of Iron is carefully poured over its surface, there is no purple colour developed where the two liquids unite. Commercial S′ is apt to contain Nitrous acid, or an oxide of Nitrogen; and Sulphate of Lead. When diluted with its own volume of water, a scanty muddiness is produced by the deposition of Sulphate of Lead. No orange fumes escape when no Nitrous acid is present, which, as well as Binoxide of Nitrogen, is indicated by a solution of the Protosulphate of Iron.

In consequence of some S′ being made from the Sulphur obtained from Iron Pyrites, which often contains some Arsenic, this metal, in the form of Arsenious acid, is sometimes present. Dr G. O. Rees found 22·58 grains of this acid in f℥xx. of oil of vitriol, and Mr Watson states that the smallest quantity which he has detected is 35½ grains in f℥xx. For the detection of this impurity, the acid must be diluted, and the tests for Arsenic, q. v., applied. This is why the L. C. provided that no *yellow* precipitate should be thrown down on the addition of H S.

Purification.—A method of purifying and concentrating the Sulph. acid of commerce was adopted in the B. P. (1864) from the D. P. of 1850. 12 oz. of the acid are distilled in a plain retort with ¼ oz. of sulphate of ammonia in powder, and a few slips of platinum foil, to moderate ebullition. The upper part of the body of the retort is covered with a sheet-iron hood to retain the heat. The first bulk of the product is rejected as containing too much water, and the distillation carried on until only an ounce of liquid remains in the retort. The sulph. ammonia is to remove any Nitric or Nitrous acids. Any sulphate of lead remains behind in the retort. The product of this process was stated by the B. P. to be "monohydrated sulphuric acid," with a Sp. Gr. of 1·846. This is not strictly correct. The monohydrated acid has a Sp. Gr. of at least 1·85, and congeals in cold weather, so that it is scarcely adapted for use in Pharmacy. Mr Redwood states that the distillation in glass retorts is difficult, if not impossible. This plan of purification is now given up.

Inc.—Many medicinal substances are incompatible with S′, as the Oxides of the Metals, some of the Earths, the Alkalies, and the Carbonates of all, also their Acetates, &c. The solutions of Lead and

Lime. The former it is especially necessary to remember, as it is often desirable to prescribe both Sul' and Acetate of Lead in the same cases.

Antidotes.—Chalk, Whiting, Magnesia, Soap. Dilution. Demulcents.

ACIDUM SULPHURICUM DILUTUM, B. Diluted Sulphuric acid.

Prep.—B. Take of *Sulphuric acid*, f℥vij.; *Distilled water*, a sufficiency. Dilute the acid with f℥lxxvij. of the water, and when the mixture has cooled to 60° add more water, so that it shall measure f℥lxxxiijß. Or as follows:—Take of *Sulphuric acid*, gr. 1350; *Distilled water*, a sufficiency. Weigh the acid in a glass flask, the capacity of which, to a mark on the neck, is one pint, then gradually add distilled water until the mixture, after it has been shaken and cooled to 60°, measures a pint.

Heat is evolved in the process, condensation ensues, and unless the acid be perfectly pure, a little Sulphate of Lead is precipitated. The second mode of preparation resembles that of the Lond. Pharm. The dilute acid of L. 1851, had a Sp. Gr. of 1·103, and contained 12·43 per cent. of dry $S\,O_3$. In B. 1864, the Sp. Gr. was 1·087, 12 per cent. weaker. It is now between the two.

Tests.—Sp. Gr. 1·094. 359 *gr.* (6 *fl. dr.*)=1000 *gr. measures volumetric Sol. Soda* (10·14 per cent. of anhydrous sulphuric acid). Six fluid drachms, therefore, correspond to 40 grains of the anhydrous acid (one equivalent of $S\,O_3$).

Action and Uses of Sulphuric Acid.—In a large dose, or undiluted with water, Sulphuric acid is a dangerous corrosive poison, burning and destroying the parts with which it comes in contact. When given in excess as a medicine, it is apt to produce irritation of the intestinal canal. In small doses properly diluted, it may be given in cases where it is desirable to produce an acid reaction, or to counteract alkalinity in any of the secretions. Tending to render the urine acid, it is useful in cases of Alkaline Urine with Phosphatic deposits. Or it may be prescribed in Dyspepsia, when accompanied by an alkaline condition of the gastric juice. In the second place, this acid is a powerful Astringent. It checks secretion, counteracts hæmorrhage, and braces the muscular tissue throughout the body. It may be used in Hæmoptysis, Melæna, or Profuse Sweating. It is often united with Tonics in simple Debility. It is said to be of especial use in Atonic Diarrhœa. Lastly, like other acids, it is given in drinks to allay the sensation of thirst in febrile disorders, whence it gains the title of Refrigerant.

Dose of the Dilute Acid.—♏x.–♏xxx. diluted with water, some bland liquor, or some bitter infusion.

Infusum Rosæ Acidum, contains about ♏vi. in each f℥.

ACIDUM SULPHURICUM AROMATICUM, B. Aromatic Sulphuric acid.

Prep.—B. Take of *Sulphuric acid*, f℥iij. or 2419 grains by weight; *Rectified spirit*, Oij.; *Cinnamon bark*, in coarse powder, ℥ij.; *Ginger*, in coarse powder, ℥1½. Mix the sulphuric acid gradually with the spirit, add the cinnamon and ginger, macerate for seven days, agitating frequently, then filter.

This is from the late E. P.; it is intended to be a simple form of the acid elixir of Mynsicht, and is a pleasant method for exhibiting Sulphuric acid, as it is merely diluted with spirit instead of with water, with the addition of aromatic principles ; Dr Duncan having ascertained that the alcohol and Sul' mixed in the above proportions do not react on each other, as has been sometimes supposed.

Tests.—Sp. Gr. 0·927. 304·2 *gr.* (6 *fl. dr.*)=830 *gr. measures volumetric Sol. Soda* (10·91 per cent. of anhydrous sulphuric acid). Six fluid drachms, therefore, correspond to 33·2 grains of anhydrous acid. The acid of 1864 was somewhat stronger.

Dose.—ʒj.–ʒiij.

ACIDUM SULPHUROSUM. Sulphurous Acid.

This acid ($S O_2$) contains one equivalent of Oxygen less than Sulphuric acid. It is produced by burning sulphur. It is a colourless, transparent gas, of a remarkably pungent odour, and Sp. Gr. of 2·2. It is irrespirable. It reddens moistened Litmus paper, and bleaches some other vegetable colouring matters, as that of roses. Water will absorb 33 times its volume. At 14° F., $S O_2$ forms a liquid ; at − 105 a crystalline solid. $S O_2$ may be also made by treating $S O_3$ with metallic copper or mercury, when the metal is oxidised at the expense of the $S O_3$, a sulphate of the oxide being produced and Sulphurous acid gas evolved. Sulphurous acid combines with alkalies and metallic oxides to form soluble salts called Sulphites.

ACIDUM SULPHUROSUM, B. Solution of Sulphurous Acid.

Prep.—B. Take of *Sulphuric acid*, f℥iv. ; *Wood charcoal*, broken into small pieces, ℥j. ; *Water*, f℥ij. ; *Distilled water*, Oj. Put the charcoal and sulphuric acid into a glass flask, connected by a glass tube with a wash-bottle containing the two ounces of water, whence a second tube leads into a pint bottle containing the distilled water, to the bottom of which the gas-delivery tube should pass. Apply heat to the flask until gas is evolved, which is to be conducted through the water in the wash-bottle, and then into the distilled water, the latter being kept cold, and the process being continued until the bubbles of gas pass through the solution undiminished in size. The product should be kept in a stoppered bottle in a cool place.

The $S O_3$ is deoxidised by the charcoal, $S O_2$ being formed as well as C O (Carb. oxide) and some $C O_2$. The first bottle arrests any $S O_3$ that may have passed over. This solution of Sulphurous acid is colourless, and with a strong suffocating odour. It contains 9·2 per cent. of $S O_2$. It should have a Sp. Gr. of 1·04, and leave no residue when evaporated. Should give little or no precip. with Sol. Chloride Barium (no $S O_3$), but a copious one if Chlorine water be also added. ($S O_2$ and Cl being together, the water is decomposed, and $S O_3$ and H Cl formed.) With Iodine it forms Hydriodic acid, taking itself the Oxygen of the water. Its affinity for Oxygen makes it useful in Chemistry as a deoxidising agent. The B. P. gives the following test of strength : "34·7 *gr. mixed with* 1 *oz. dist. water and a little mucilage of starch does not acquire a permanent blue colour with the volumetric Sol. Iodine until* 1000 *gr. measures have been added.*" Hydriodic acid does not turn starch blue. At the point mentioned, the Iodine is just in excess.

Action and Uses.—As produced by burning Sulphur, $S O_2$ in the form of gas has been used as a disinfectant from ancient times. It decomposes Sulph. Hydrogen with the precipitation of Sulphur, and thus removes bad smells. It is a poison to minute vegetable and animal organisms. Sulphurous acid, or "sulphur baths," are often used as a remedy for impetigo, scabies, eczema, lepra, and as alterative in various uterine and hepatic affections. The fumes of ℥ß. of burning sulphur, not allowed to reach the face, are combined with steam for a vapour bath. Liquid Sulphurous acid may be prescribed internally in the same skin diseases. Also recommended in the dyspepsia and vomiting produced by *Sarcinæ ventriculi*, as it kills the vegetable growth which is the cause of the disorder. The action of the *Sulphites* of Potash and Soda is partly similar to that of Sulphurous acid, the latter being set free from its salts by the acid of the stomach. Dose of Sulphurous acid, B. P. ʒß.–ʒj. in water.

PHOSPHORUS, B.

F. Phosphore. *G.* Phosphor.

Phosphorus ($P = 31$), from φως, *light*, and φερω, *I bear*, though so remarkable a substance, was not discovered before 1669, when it was found in the Phosphate of Soda and Ammonia of Urine, by Brandt, an alchemist of Hamburgh. Knuckel in Germany and Boyle in England had also the credit of discovering it. The Continent was for some time supplied with Phosphorus from England, prepared by Hankwitz, an apothecary of London. It is now procured almost entirely from the ashes of bones, which consist chiefly of Phosphate of Lime. It is a constituent of other animal substances, and also of some vegetables. It occurs in the mineral kingdom in the form of phosphates, which give fertility to some soils.

Prop.—Phosphorus is a soft, flexible, easily cut, semi-transparent, wax-like solid, Sp. Gr. = 1·77, colourless, or yellowish, devoid of taste as well as smell when pure; immediately it is exposed to the air, garlicky fumes are evolved; it becomes luminous in the dark, in consequence of its combination with Oxygen; this slow combustion produces heat, and sets it on fire. It is so inflammable as to take fire almost spontaneously in the open air; hence it is requisite to keep it under water, as the least friction excites heat enough to make it do so.* When air is excluded, it melts at 110° F., and boils at 574°, passing off as a colourless vapour; at 32° it is crystalline and brittle, and from its solution in hot naphtha it may be obtained in dodecahedral crystals. Phosphorus is insoluble in water, but if kept long in it, some of the water becomes decomposed; and if in closed vessels, according to Berzelius, the water becomes luminous if agitated. The Phosphorus also acquires a white coat, and, if much exposed to the light, becomes of a reddish tint. This has been thought to be an Oxide or a Hydrate, but has been shown

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* Lucifer or Congreve matches are generally tipped with a paste made of phosphorus 10 parts, gelatine, red lead, and nitre, 25 parts each.

by Rose to be only a peculiar mechanical state. Professor Schrötter has shown that common Phosphorus may be changed into this red kind by being heated for some time in closed vessels. It is then brittle and metallic in appearance, having lost its luminous and waxy character. It is not so combustible or fusible, and is unchanged in the air. When heated to 460° F. out of the air, it becomes again common Phosphorus. By the aid of heat P. is soluble in Alcohol, Ether, the fixed and volatile Oils, in Naphtha, Petroleum, Sulphuret of Carbon, &c.

Prep.—It is obtained on the large scale by the action of Sulphuric acid on powdered bone-ash, which consists chiefly of Phosphate of Lime. This is digested with half its weight of S′ diluted, which unites with a portion of Lime, &c. A Superphosphate of Lime is formed by the remainder of the Phosphate combining with the Phosph′ set free. This is dissolved out, filtered, and evaporated. It is then mixed with one-fourth its own weight of Charcoal, and some fine quartz sand, and strongly heated. The Carbon takes the Oxygen of the Phosphoric acid, becoming Carbonic Oxide, which passes over. Phosphorus is evolved, and received under water in the form of a reddish-brown fusible substance. It is purified by pressing it, when melted, through chamois leather, also by melting in hot water in glass tubes, from which, on cooling, the Phosphorus separates in little sticks. This is the form in which it is usually met with in commerce.

Tests.—Easily recognised by the above very remarkable characters. "Soluble in Ether and in boiling Oil of Turpentine." B.

Action. Uses.—Phosphorus is an irritant poison, of which one grain may be considered as a fatal dose. It is not often administered in England. It acts as a stimulant in cases of nervous prostration consequent on spasmodic affections, or may be given to rouse the vital powers in low forms of Typhoid Fever, or in an advanced stage of Phthisis. The dose is about $\frac{1}{40}$th of a grain. Four grains may be dissolved in ℥j. of Ether or Olive Oil, and ♏v.–♏xx. of this prescribed as a dose. The red variety is nearly inert.

Antidotes.—Dilution. Demulcents. Magnesia. Duflos and Becher recommend a mixture of one part of Calcined Magnesia with one of Chlorine water.

PHOSPHORUS AND OXYGEN.

PHOSPHORIC ACID. *F.* Acide Phosphorique. *G.* Phosphorsäure.

Phosphoric acid (P′ or $PO_5 = 71$) was first distinguished in 1760 by Marggraff. Phosphorus unites with Oxygen, and forms oxides and acids. Phosphoric′ may be obtained by the first part of the above process for obtaining Phosphorus, by decomposing the solution of Biphosph. Lime by Sesquicarb. Ammonia, separating the Lime and heating the Salt obtained, during which Am. escapes and P′ remains; or by burning P. in Oxygen or in Air; or enabling it to obtain the Oxygen from some substance which parts easily with it, such as Nitric′. This last is the method adopted by the B. P. The compounds of Phosphorus with Oxygen are among those which are most interesting to chemists, and are fully treated of in chemical works.

ACIDUM PHOSPHORICUM DILUTUM, B. Dil. Phosphoric Acid.

Prop.—Dilute Phosphoric acid is a colourless solution, having a Sp. Gr. of 1·08, without odour, with a powerful acid taste, and reddening Litmus. It contains 10 per cent. of anhydrous, P O_5. It forms salts with alkalies, earths, and metallic oxides. Even when in a concentrated state, the acid is not corrosive to organised structures. By evaporation it is reduced to a state of concentration and the appearance of a brown oily liquid, and is then a Hydrated Phosphoric acid. By an increase of temperature it loses more water, and becomes Pyrophosphoric acid. When the heat is raised to redness another equivalent of water is lost, when it becomes Metaphosphoric acid. According to Graham, these acids differ in the amount of base with which they combine, true Phosphoric acid being P O_5, 3 H O—Pyrophosphoric, P O_5, 2 H O—and Metaphosphoric, P O_5, H O. Liebig considers the three acids as different, and that Hydrogen is united in each with a different compound radical.

Prep.—B. Take of *Phosphorus*, gr. 413; *Nitric acid*, f℥vj.; *Distilled water*, a sufficiency. Put the nitric acid, diluted with ℥viij. of distilled water, into a tubulated retort connected with a Liebig's condenser, and having added the phosphorus, apply a gentle heat so as slowly to distil f℥v. of liquid. Return this to the retort, and continue the distillation, occasionally returning the distillate, until the phosphorus has entirely disappeared. Transfer the contents of the retort to a procelain dish of hard well-enamelled ware, and evaporate the liquid until it is reduced to f℥iv.; then, transferring it to a platinum vessel, continue the evaporation until it is reduced to about f℥ij., and orange-coloured vapours are no longer formed. Mix it now with distilled water until when cold it measures one pint.

Diluted acid is used in consequence of the explosion and rapid combustion which Phosphorus causes when added to strong Nitric′. With the diluted acid the action is slow, the Phosphorus gradually melts, and combines with a portion of the Oxygen of the acid, while the remainder escapes in combination with the Nitrogen of the Nitric′ in the form of Nitric oxide gas. A portion, however, of the Nitric′ distils over before the whole of the Phosphorus is acidified, and therefore it is necessary to return it into the retort as directed. M. Personne recommends *red phosphorus* (*see* p. 38) as being less dangerous than common P. in the preparation of the acid.

Tests.—Phosphoric acid with Soda forms an officinal salt (the Phosphate of Soda). Lime water produces in it a precipitate of insoluble Phosphate of Lime. This, and the Phosphates of Barytes, Strontian, Lead, &c., are soluble in dilute Nitric acid, also in Ammonia. With Ammonio-nitrate of Silver Phosphoric acid throws down a yellow precipitate of Phosphate of Silver. Arsenious acid is also similarly affected; but it may be distinguished from it by Hydrosulphuric acid, which causes a yellow precipitate in the Arsenious, but none in the Phosphoric acid. The Phosph. Silver is sol. in Ammonia and in dil. Nitric acid. The addition of Carbonate of Soda ought to cause no precipitate if the acid contains no Lime as an impurity, which it is apt to do from the mode in which it is usually made. Phosph. acid should give no precip. with Chlor. Barium (test for $S\,O_3$), or Nitrate of Silver acidulated with Nitric acid (test for H Cl), or with solution of Albumen. The other mineral acids precipitate Albumen. Phosph. acid does not. Added to an equal volume of Sulph. acid, and solution of Sulph. Iron, it does not darken it. B. P. This is a test for Nit. acid. "℥vj. *poured upon* 180 *gr. of litharge in powder, leave after evaporation a residue* (*Phosph. lead*) *which, heated to dull redness, weighs* 215·5 *grains.*"

Action. Uses.—Phosphoric acid may be given generally as the other mineral acids, and is considered by some to be especially applicable in cases of Alkaline urine, and in Ossification of the arteries, as it possesses the power of dissolving Phosphate of Lime. It has been also recommended in Caries and Mollities Ossium. It may be employed in the preparation of Refrigerant drinks to allay thirst in Diabetes and febrile affections; but it possesses neither the astringent property of Sulphuric, nor the alterative powers of Nitric acid.

Dose.—♏x.–f℥j. diluted with sugar and water.

Incomp.—All such substances as are incompatible with other acids.

BORON.

F. Bore. Borium. *G.* Boron.

Boron (B = 11) was ascertained, by Sir H. Davy, in the year 1807 to be the basis of Boracic acid. It was obtained by heating Potassium with Boracic acid, as a dark olive-coloured powder, devoid of taste and smell, and not acted upon by the usual reagents; heated in the air or in Oxygen, it is converted into Boracic acid.

BORACIC ACID, B. (Appendix). Acidum Boracicum. *F.* Acide Boracique. *G.* Borax Säure.

Boracic acid ($BO_3 = 35$) is so named from Borax, a salt long known, and which is a Biborate of Soda (q. v.); from the Soda of which it may be separated by the action of Sulphuric′: a soluble Sulphate of Soda is formed, and the Boracic acid precipitated. Boracic acid is largely obtained in Tuscany and in the Lipari Isles, where it issues in the steam from fissures in the earth. Circular basins are dug, or the fissures surrounded with cylinders of brickwork, and water is let in, which boils up, from the vapour passing into and through it. The water, having dissolved the acid, is evaporated, and, as it cools, the acid is deposited in scale-like crystals, which are then dried.

Prop.—Boracic acid is usually seen in transparent scale-like crystals, which have a feeble acid taste, and redden Litmus slightly, at the same time that they colour Turmeric brown, like an alkali. It is sparingly soluble in cold, but requires less than 3 times its weight of boiling water to dissolve it. It is very soluble in Alcohol, tinging the flame of a green colour when it is burnt. The crystals contain 3 Eq. of water of crystallisation, which is expelled on their being heated; the acid then melts, and on cooling is brittle and glass-like, and may be variously coloured. As the salts of this acid promote the fusion of other bodies, Biborate of Soda is much employed as a blowpipe flux.

Action. Uses.—Boracic acid is not officinal, except as a test, and as a constituent of Borax, the Biborate of Soda. It was formerly supposed to have some anodyne properties, and was known by the name of *Sal sedativus.* It is sometimes used to increase the solubility of Cream of Tartar, 1 part Bor′ with 7 parts Bitartrate of Potash forming the SOLUBLE CREAM OF TARTAR of the shops.

SILICON AND SILICA.

Silicon ($Si=21$) is a non-metallic element, which, in the state of oxide, forms a large portion of the crust of the globe, as Flint, Quartz, and Sand. It is obtained from Silica in the same way as Boron from Boracic acid, though with great difficulty. It is a dark-brown insoluble powder; about twice as heavy as water; very infusible, and not acted upon by any acid but the Hydrofluoric.

SILEX CONTRITUS (L., 1851), or powdered flint, consists of Silica in a very pure state. Before powdering, the flint may be heated and thrown hot into water, when it will crumble in pieces. Silica ($Si\,O_3=45$) is also called Silicic acid, because it combines with bases. With a certain quantity of alkali, it forms glass, but with more of the alkali, a soluble silicate. The above form of Silica was employed by the L. C. in the preparation of Distilled waters. The flint being very finely powdered, is rubbed up carefully with the essential oil, and then with the water, in which both are finely suspended. By this means the particles of volatile oil are intimately mixed with the water, and enabled to dissolve in it, before the distillation.

NITROGEN AND OXYGEN.

Nitrogen combines with Oxygen in several proportions, which it is desirable to notice, as illustrating the law of definite proportions, and because the several compounds are formed in the course of making various Pharmaceutical preparations.

Nitrous Oxide	$N\,O$,	$14+8=22$.
Nitric Oxide	$N\,O_2$,	$14+16=30$.
Hyponitrous Acid	$N\,O_3$,	$14+24=38$.
Nitrous Acid	$N\,O_4$,	$14+32=46$.
Nitric Acid	$N\,O_5$,	$14+40=54$.

ACIDUM NITRICUM, B. Nitric Acid. *Aqua Fortis. Spiritus Nitri Glauberi.* *F.* Acide Nitrique. *G.* Saltpetersäure.

Nitric acid (N' or $N\,O_5=54$) is an acid compound of Nitrogen with Oxygen. It was known to Geber, and probably also to the Hindoos. Cavendish first clearly ascertained its composition by forming the acid by passing electric sparks through atmospheric air over a solution of Potash. Phil. Trans. vol. 75, p. 572, and vol. 78,

p. 261 (1785). It may frequently be detected in the atmosphere after thunderstorms, in consequence of the Oxygen and Nitrogen combining together with the aid of electricity. In combination with Potash, Soda, and Lime, or Ammonia, it is found effloresced on the soil in some countries ; also in some minerals ; likewise in some vegetables, as in the officinal Pareira root, in the state of Nitrate of Potash.

Prop.—Anhydrous Nitric′ has been obtained in prismatic crystals by treating Nitrate Silver with dry Chlorine, but the acid is generally seen as a liquid in combination with water. When pure it is colourless, transparent, of a very sour corrosive taste, destroying vegetable and animal matter. It tinges the skin yellow by the formation of Xantho-proteic acid, and causes it to peel off ; gives acid properties to a large quantity of water, vividly reddening Litmus and vegetable blues. It has a strong, almost suffocating odour, fumes in the air, from condensing its moisture ; fumes still more if Ammonia be present. Its affinity for water is great, absorbing it from the air, and having its Sp. Gr. and strength diminished ; when mixed with it, heat is evolved. Its strength necessarily depends on the quantity of water mixed with it ; the density of the B. P. acid is now the same as that of the L. P., 1·42 (B. P. 1864, used a stronger acid of 1·5). Mr Phillips states that 1·504 is the strongest that can be procured by simple distillation ; but it has been brought, by distilling with a gentle heat, by Kirwan to 1·55, and by Proust to 1·62. The Nitric′ of commerce, commonly called Aqua Fortis, has a Sp. Gr. 1·380 to 1·390. Dr Christison considers 1·500 as the densest acid which can be obtained free of Nitrous acid, but, impregnated with this, it may be got so heavy as 1·540 and upwards. The purest Nitric′, if long exposed to light, becomes yellowish from decomposition, Oxygen being given out, and Nitrous acid formed. This may be got rid of by the action of heat, when it escapes in the form of Nitrous fumes, leaving the Nitric′ nearly colourless. Nitric′ of Sp. Gr. 1·50 will freeze at − 40°, and will boil at 247°, but these points vary, of course, with the density ; if the heat be continued, the acid volatilises, and at a red heat is decomposed. At the density of 1·5 it consists of 2 Eq. of Nitric′ and 3 Eq. of Water, and it then contains about 80 per cent. of acid. Acid of Sp. Gr. 1·42 contains 60 per cent., and consists of 1 Eq. acid and 4 Eq. water ; and the other may be reduced to this density by adding to it 34 per cent. of water.

Many vegetable substances, as Charcoal, Sugar, Alcohol, also Phosphorus, deprive Nitric′ of its Oxygen, and hence it is one of the most powerful oxidising agents. The Metals do not in general decompose it when concentrated, but if diluted with water, this becomes decomposed as well as the acid, both yielding Oxygen to oxidise the Metal ; the oxide is insoluble, or, being acted on by some of the undecomposed acid, a Nitrate is formed. The other part of the decomposed acid escapes in the form of Nitric oxide gas, which uniting with the Oxygen of the atmosphere, ruddy fumes of Nitrous acid gas are observed. If Copper filings be used, then the solution will be of a greenish-blue colour. "The orange vapour, conducted into a solution of sulphate of iron, communicates to it a dark colour." If Hydrochloric′ is mixed with Nitric′, both become decomposed, and the mixture, called Nitro-Muriatic acid, or Aqua Regia, is capable of dissolving gold.

The presence of N′ may be ascertained by the bright-red colour produced when N′ touches Morphia or Brucia; saturated with Carb. of Potash, it forms Nitrate of Potash, which deflagrates. If heated with a strong solution of Protosulphate of Iron, slightly acidified with $S O_3$, a reddish-brown colour, of greater or less intensity, is produced.

Prep.—Pour *Sulphuric acid*, ℔j. upon *Nitrate of Potash*, ℔j., previously introduced into a plain retort. Pass the neck of the retort into the glass tube of a Liebig's condenser, and distil over the acid with a heat which towards the end of the process must be raised. (Nitric′ may be formed by passing electric sparks through a mixture of 1 part of Nitrogen and 5 of Oxygen.)

The B. P. now gives no formula, but describes Nit. acid as "An acid prepared from Nitrate of Potash or Nitrate of Soda by distillation with Sulphuric acid and water, and containing 70 per cent. of Nitric acid ($N O_5$, $H O$), or 60 per cent. of dry acid ($N O_5$). Sp. Gr. 1·42."

On the large scale *Aqua fortis* is made similarly with Saltpetre, or native Nitrate of Soda obtained in Peru, an immense iron retort being used, and a series of earthen condensers connected by tubes.

The strong fuming acid of L. 1836 was substituted in the B. P. 1864 for the weaker acid of the L. P. 1851. The latter, however, is less liable to change. When exposed to light the acid of Sp. Gr. 1·5 changes rapidly to a red colour from the formation of $N O_4$, and thus loses in strength.

In the above process the Nitrate of Potash being decomposed by the Sulphuric′, this combines with the Potash to form Sulphate of Potash; the Nitric′, as set free, rises with the vapour of water, and forms aqueous Nitric′. If too strong, it must be diluted with water. When of the Sp. Gr. 1·42 it contains about 70 per cent. of the Hydrated acid, 60 of dry $N O_5$.

Tests.—The strength of N′ may be ascertained by its Sp. Gr., which, according to the B. P., is 1·42. "90 *grains with ½ oz. water neutralise* 1000 *measures of volumetric Sol. Soda.*" B. It should pass off wholly in vapour, showing the absence of any fixed salts, as of Potash, that is, Nitre. The presence of Nitrous acid is indicated by a yellow or orange colour; it may be got rid of by the gentle application of heat. Sulphuric′ is indicated by a white precipitate (Sulphate of Baryta) being formed when the acid, diluted, is tested with Sol. of Chloride of Barium, or of Nitrate of Baryta. Hydrochloric′ will be detected by a white precipitate (Chloride of Silver) being formed with solution of Nitrate of Silver. If it contain free Chlorine, it will have the power of dissolving gold. The Nitrate of Soda from Chili contains Iodine. Nitric acid prepared from this is at first brown from the presence of Iodine (which may then be detected by starch), but after a time it becomes colourless from the oxidation of the Iodine into Iodic acid. (Pereira.)

Action. Uses.—Nitric acid undiluted is a powerful caustic. It has been recommended for external use in certain surgical diseases, as Sloughing Chancres, Hæmorrhoids, poisoned Bites. Its application requires great caution. Taken internally this acid is a corrosive poison. In the diluted form it may be prescribed in cases where we desire the action of an acid upon any of the secretions. But it differs from Sulphuric acid in two respects. It is not adapted for internal use as an astringent; and it exerts an action in the blood which has gained it the name of Alterative. It has been recommended in certain cases of Syphilis, in Oxaluria and Dyspepsia, in disorders of the Liver, in Squamous and other skin diseases. When thus given as an alterative, it may often be advantageously combined with Hydrochloric acid.

Inc.—Alkalies, Earths, Oxides of Metals, their Carbonates, and Sulphurets, all combustible bodies, Alcohol, Sulphate of Iron, Acetates of Potash and Soda, Diacetate of Lead.

Antidotes.—The carbonates of earths, as Chalk, Whiting; Bicarbonates of Alkalies; Soap.

Acidum Nitricum dilutum, B. Dilute Nitric Acid.

Prep.—B. Take of *Nitric acid*, ℥vj.; *Distilled water*, a sufficiency. Dilute the acid with ℥xxiv. of the water, then add more water, so that at a temperature of 60° it shall measure ℥xxxj. Or as follows:—Take of *Nitric acid*, gr. 2400; *Distilled water*, a sufficiency. Weigh the acid in a glass flask the capacity of which, to a mark on the neck, is one pint, then add distilled water until the mixture, at 60° temperature, after it has been shaken, measures a pint.

The Sp. Gr. of the B. acid is 1·101. It contains about 15 per cent. of dry acid, and is thus stronger than the Dil. Nit. acid of the L. P., which contained only 12 per cent. and had a Sp. Gr. of 1·082.

"ʒvi. *neutralise* 1000 *measures of the volumetric Sol. Soda.*" B.

Dose.—♏x.-♏xxx. diluted with water, &c. Should be drunk through a quill, like the other strong acids.

Iodinium.

Iodum, B. Iodine. *F.* Iode. *G.* Iod.

Iodine (I=127), from ἰώδης, *violet*, the colour of its vapour, was obtained by M. Courtois in 1812 in the residual liquor of the process for obtaining Soda from Kelp. Though but lately discovered, its effects have long been obtained in medicine, as it is found in Sea and several Mineral waters, and in Sea-weeds, Sponge, Corals, and some Molluscous animals. In the present day, the leaf of a Sea-weed (a species of Laminaria, *Dr Falconer*) is employed in the Himalayas, and called the *goître-leaf*, and in S. America the stems of a Sea-weed are sold by the name of *goître-sticks*, because they are chewed by the inhabitants wherever goître is prevalent.*

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* *Vide* Royle's Illustr. of Himalayan Botany, p. 441.

Prop.—Iodine occurs in metallic-like scales. Its crystals may be obtained in elongated octohedrons with rhomboidal bases. It is of a bluish-grey colour, with a metallic lustre, an acrid taste, and an odour resembling that of Chlorine. Its Sp. Gr. is 4·94; but it is soft, and crumbles between the fingers, staining the skin of a yellow colour. It is rather insoluble in water, one grain requiring 7000 parts of water to dissolve it; but it is very soluble in Alcohol and Ether, forming reddish-brown solutions; it is also soluble in essential oils. It evaporates at ordinary temperatures; but when heated, Iodine melts at 225°, and at 350° rises in a beautiful violet-coloured vapour, which is remarkable for its great weight, having a Sp. Gr., compared with that of air, = 8·7, but with that of hydrogen as 127 to 1. Hence its atomic number is 127, the atomic numbers of most simple bodies corresponding with the Sp. Gr. of their vapour. The solubility of Iodine in water is much increased by the presence of some salt in solution, and this is taken advantage of in preparing the tincture of the Pharmacopœia. Debaugne states that Tannic acid also increases its solubility, and that two grains will enable ten grains of Iodine to dissolve in 6 oz. of water.

One of the most useful combinations that Iodine forms, is with Starch, as this serves as a very delicate test of its presence. If a solution of Starch be formed, and allowed to cool, and then added, even though very diluted, to a solution containing Iodine, a blue precipitate of the Iodine in union with the Starch, or an Iodide of Starch, or of Amidin, as it has been lately called, will be produced. It is, however, essential that the Iodine be in a free state; hence in compound solutions it is necessary to add a few drops of a solution of Chlorine (or Chlorinated Soda), to detach it from its combinations, when the blue colour of the Iodide of Starch will immediately appear. A mineral acid may be used for this purpose, but it does not produce the colour directly unless an Iodide and an Iodate are present at the same time. (*Vide* tests for Iodide Potassium.) Chlorine simply sets free and displaces Iodine. An acid decomposes the solution of an Iodide, so as to form Hydriodic acid. If heated, or exposed for some time to the air, this combines with Oxygen, forming water and free Iodine. But Nitric' containing the smallest quantity of Nitrous' will act in the same way as a solution of Chlorine, for Nitrous acid will set free Iodine at once, as has been shown by Dr Price. (P. J. xi. 133.)

Though present in a variety of situations, Iodine is obtained for commercial purposes from the ashes of Sea-weeds, called Kelp, and is largely prepared at Glasgow. Professor Graham states, that the long elastic stems of *Fucus palmatus* afford most of the Iodine contained in Kelp; and as this is a deep-sea plant, it is found most on exposed sea-coasts. Dr Traill says, that the greatest quantity is produced by Kelp made from "drift-weed," which is in a great measure composed of *Fucus digitatus* and *F. Loreus;* and that "cut weed," which consists of *F. vesiculosus* and *F. serratus*, yields much less of it. It is also yielded in very large proportion by certain species of Laminaria, especially the common *L. digitata.* According to the experience of a manufacturer, 100 tons of Caithness Kelp yield 1000 pounds of Iodine, or about a 224th part. (C.)

The most common method of obtaining Iodine is to take Kelp in powder, lixiviate with water, evaporate, and remove the Soda salts (such as the Carbonate and Sulphate) as they form; allow the liquor to cool, when crystals of Chloride of Potassium will be deposited. Decant the dark-coloured mother liquor, which contains the Iodide of Sodium with other salts; supersaturate with Sulphuric′, when an evolution takes place of Carbonic′, Sulphuretted Hydrogen, and Sulphurous acid gases. After standing for a day or so, the residuary liquor, or Iodine ley, is mixed with Binoxide of Manganese, and hear applied. Water and Iodine pass over, and are condensed in receivers.

Here the mutual action of Sulphuric′ and Binoxide of Manganese on any Chloride in the Iodine ley, will be the detachment of Chlorine (*see* Hydrochloric acid). This, as stated above, will decompose the Iodide, and set the Iodine free; or, as usually explained, one equivalent of the Oxygen of the Binoxide, combining with the Sodium at once, sets the Iodine free, and the Sulphuric′ will combine with the Soda and the Oxide of Manganese, and thus form a Sulphate of Soda (the Oxide of Sodium), and a Sulphate of the Oxide of Manganese.

Tests.—The violet colour of the vapour, the reaction with Starch, and the solubility in an akaline ley, are the best positive tests for Iodine. Iodine is sometimes adulterated with Charcoal, Plumbago, or Oxides of Manganese; but its chief impurity is moisture, of which it sometimes contains as much as 15 to 20 per cent., when it looks wet, and sticks to the sides of the bottle. It should be entirely soluble in ether. As Cyanides of Iodine and Bromine are apt to be derived from the sea-water or sea-weeds which yield Iodine, the B. P. adds the following test:—"Sublimes without leaving any residue, and the portion which first comes over does not include any slender, colourless prisms, emitting a pungent odour." The quantitative test is based upon the deoxidising property of the Hyposulphite of Soda, which, removing the Oxygen of water, and exhibiting the Hydrogen to the Iodine, turns the latter into the colourless Hydriodic acid. "12·7 *grains dissolved in* 1 *oz. of water containing* 15 *grains of Iodide Potassium require for complete decoloration* 1000 *measures of the volumetric Sol. Hyposulphite of Soda.*"

For pharmaceutic preparations of fixed and uniform strength, the E. C. directed Iodine to be dried by being placed in a shallow basin of earthenware, in a small confined space of air, with ten or twelve times its weight of fresh-burnt Lime, till it scarcely adheres to the inside of a dry bottle.

Action. Uses.—The extensive use in medicine of Iodine and its compounds was first brought about by the discovery, made not long ago, that this substance was the active ingredient of burnt Sponge, a remedy long used in goître. Given internally, Iodine passes into the blood. It tends after a time to impoverish this fluid, and in this manner stimulates the absorbents to the removal of the solid tissues. Its prolonged and injudicious use has been known to occasion the absorption of the mammæ or the testicles. It has a powerful alterative (or curative) action in two classes of disease—that is to say, it is Antisyphilitic and Antiscrofulic. Both Iodine and Iodide of Potassium are of use in cases of Secondary Syphilis. They may be given also in late or tertiary cases, but their utility is less apparent in the primary affection. Both are of great use in Scrofula, as evinced by swellings of the joints, enlarged glands, &c. A strong solution of Iodine may be painted over these swellings with great advantage in many cases. It acts as an efficient counter-irritant, and is probably absorbed through the skin into the tissues and fluids of the part.

Iodine may be used as a diuretic in Dropsies. It passes into the urine, in which it may be detected by chemical tests. When given too freely, it may produce the train of symptoms known as *Iodism*, the chief of which are a low febrile state, nervous depressions, running at the eyes and nose, with swelling or eruption of the face.

Dose.—Gr. j.–gr. v. with some mild extract.

Antidotes.—Large draughts of solution of Starch, both before and after evacuating the stomach; also obviate inflammation.

Iodide of Starch, proposed by Dr Buchanan, is a mild preparation. It is directed to be made by rubbing gr. xxiv. of Iodine with a little water, and gradually adding ℥j. of finely-powdered Starch. Dry by a gentle heat, and preserve the powder in a well-stoppered bottle.

Dose.—ʒß. gradually increased. It has been given in very large doses.

Liquor Iodi, B. Solution of Iodine.

Prep.—B. Dissolve *Iodine*, gr. xx., and *Iodide of Potassium*, gr. xxx., in *Distilled water*, f℥j.

Introduced in 1867. It contains 1 gr. of Iodine, and 1½ gr. of Iod. Potassium in 24 grains. It is adapted either for external or internal use. It is not caustic, as the liniment sometimes is.

Dose.—Internally, ♏v.–♏x.

Tinctura Iodi, B. (Tinctura Iodinii composita, L. P.) (Compound) Tincture of Iodine.

Prep.—B. Dissolve *Iodine*, ℥ß.; *Iodide of Potassium*, ℥¼; in *Rectified spirit*, Oj. The quantity of Iodine is the same as in the L. *Prep.*, with only ¼ of the *Iod. Pot.*

It contains Iodine gr. j. and Iodide of Potassium gr. ½ in ♏xl. The best form for internal exhibition. It may be given with water or sherry.

Dose.—♏ x. gradually increased to fʒß.

Vapor Iodi, B. Inhalation of Iodine.

Prep.—B. Take of *Tincture of Iodine*, fʒj.; *Water*, f℥j. Mix in a suitable apparatus, and, having applied a gentle heat, let the vapour that arises be inhaled.

Introduced in 1867, with other inhalations. Of use in chronic inflammations of the fauces, especially when Syphilitic. Has been employed in Phthisis.

UNGUENTUM IODI, B. (Compound) Ointment of Iodine.

Prep.—B. Rub *Iodine* gr. xxxij., *Iodide of Potassium* gr. xxxij., and *Proof spirit* fʒj. together, then rub up with *Lard*, ℥ij.

Action. Uses.—Employed as an external application in Bronchocele, scrofulous enlargements of the glands, or tumours.

LINIMENTUM IODI, B. Liniment of Iodine. *Iodine Paint.*

Prep.—Dissolve *Iodine*, ℥1¼; and *Camphor*, ℥¼; *Iodide of Potassium*, ℥½; in *Rectified spirit*, ℥x. (½ the strength of *Prep.* of B. 1864).

This contains ⅛ part of Iodine, and is very different from the compound tincture, which contains only $\frac{1}{40}$. The tincture is intended for internal use. The liniment of 1864 was found to be inconveniently strong, and has therefore been weakened. This liniment is a substitute for Lugol's tincture, and adapted for external use as an escharotic for the dispersion of scrofulous and other tumours. (Solutions of Iodine in glycerine have been used by some practitioners. They have the advantage of not drying, so that the absorption of the Iodine goes on without hindrance.)

IODINE AND SULPHUR.

SULPHURIS IODIDUM, B. Iodide of Sulphur.

Prep.—B. Take of *Iodine*, ℥iv.; *Sublimed Sulphur*, ℥j. Rub them together in a wedgwood mortar until they are thoroughly mixed. Put the mixture into a flask, close the orifice loosely, and apply a gentle heat so that the colour of the mass shall become gradually darkened. When the colour has become uniformly dark throughout, increase the heat so as to produce liquefaction. Then incline the flask in different directions, in order to return into the liquid any portion of the Iodine which may have been condensed on the inner surface of the vessel. Lastly, withdraw the heat, and when the liquid has congealed, remove the mass by breaking the flask, reduce it to pieces, and keep these in a well-stopped bottle.

"A greyish black solid substance, with a radiated crystalline appearance. It resembles Iodine in smell, and in the property of staining the cuticle when applied to it. Soluble in about sixty parts of glycerine; insoluble in water, but decomposed when boiled with it. If 100 grains be thoroughly boiled with water the Iodine will pass off in vapour and about 20 grains of sulphur will remain."

Introduced in 1867. An old preparation of the L. P. A subiodide is produced by this process, $S_2I = 159$.

Action. Uses.—Chiefly used externally, as in the following ointment.

UNGUENTUM SULPHURIS IODIDI, B. Ointment of Iodide of Sulphur.

Prep.—B. Take of *Iodide of Sulphur*, gr. xxx.; *Prepared Lard*, ℥j. Triturate the Iodide of Sulphur in a porcelain mortar, and gradually add the lard, rubbing them together until the ointment is perfectly smooth and free from grittiness.

From the L. P. 1851. Used in skin diseases, especially those of a scrofulous character.

BROMINIUM.

BROMUM, B. Bromine. *F.* Brome. *G.* Brom.

Bromine (Br = 80), from βρωμος (*fœtor*), a strong odour, was discovered in 1826 by M. Balard, in *bittern*, the uncrystallisable residue of Sea water. The quantity contained therein is so small, that 100 pounds of Sea water yield only 5 grains of Bromide of Sodium or of Magnesium, of which 3·3 grains are Bromine. It exists also in rock-salt, in brine-springs, as those of Cheshire, in some mineral waters, sea-weeds, marine animals, and in the ashes of sponge.

Prop.—It is a liquid of a dark red, but, in thin layers, of a hyacinth-red colour, easily volatilised, and therefore requiring to be kept well closed up, and covered by a stratum of water. The taste is acrid and unpleasant, the smell disagreeable and suffocating, something like Chlorine. The Sp. Gr. of liquid Bromine is 2·96 ; that of its vapour compared with air, about 5·4 ; 100 C. I. weigh gr. 168. It freezes at - 4°, and congeals into a brittle crystalline solid of a lead-grey colour and metallic lustre ; and, if water be present, it crystallises in octohedra. At common temperatures it rises into a reddish-brown vapour, like Nitrous acid, and boils at 117°. It stains the skin yellow, but not permanently, and acts as a caustic. It destroys vegetable colours, extinguishes flame, first turning the upper part red and the lower green ; but some metals, as Antimony, &c., take fire in it. It is slightly soluble in water, more so in Alcohol, and very soluble in Ether ; but it decomposes the oils, Hydrobromic acid being formed.

Prep.—Bromine may be detached from its combinations by passing Chlorine gas through a solution containing a Bromide, or by the action of Hydrochloric and Binoxide of Manganese on *bittern*, or on the mother-liquor of the salt-springs of Germany. The Hydrogen of the Acid, uniting with the Oxygen of the Binoxide, forms water; one portion of the Chlorine unites with the Manganese, and another with the metallic base, whether Sodium, Calcium, or Magnesium, with which the Bromine was combined. This being set free, easily distils over with water, and may be condensed in a receiver.

Tests.—Bromine may be known by its liquidity, colour, weight, and acrid odour, by being sparingly soluble in water, more copiously in rectified spirit, best in ether ; also by its ready volatility, its action on the metals, and by forming an orange-yellow colour with starch, and a yellowish-white precipitate (the Bromide) with Nitrate of Silver.

Action. Uses.—A local irritant and caustic ; increases the activity of the lymphatic system. It is used in combination with Potassium, Sodium, or Ammonium. It is employed in the preparation of other medicines and as a test. It forms a colourless solution with solution of soda ; and if some bromine be added to this in small quantity, the addition of starch will not cause a blue colour. (B. P.)

Several Bromides, as those of Potassium, Ammonium, and Iron, are now used in medicine.

Dose.—5 or 6 drops of 1 part of Bromine in 40 of water or of rectified spirit. Externally as a lotion, or to moisten a poultice, a solution 4 times as strong.

Antidotes.—The same as for Iodine.

CHLORINIUM.

(CHLORUM, B.) Chlorine. *Dephlogisticated Marine* or *Muriatic Acid. F.* Chlore. *G.* Chlor.

Chlorine ($\mathrm{Cl} = 35{\cdot}5$) was pointed out by Scheele in 1774. It was the *Oxygenated Muriatic acid* of Lavoisier, which Berthollet converted into *Oxymuriatic acid*, as it was considered a compound of Oxygen and Muriatic′. Gay-Lussac and Thenard considered it an element, and named it from its characteristic yellowish green (χλωρος) colour, Chlorine. It was proved to be an elementary body by Sir H. Davy in 1809. Chlorine is not found in a free state in nature, but combined with metals in great abundance in the inorganic kingdom, chiefly as Chloride of Sodium, Rock Salt, or Common Salt, as in the waters of the ocean, and also in the organic kingdom. Dr Prout states that free Hydrochloric′ exists in the stomachs of animals during digestion.

Prop.—Gaseous Chlorine is of a greenish-yellow odour; its Sp. Gr. is 2·5. 100 C. I. weigh about 77 grs. Under a pressure of about 4 atmospheres, or when subjected to great cold, it is reduced to a bright-yellow liquid. It has an astringent taste, and a suffocating, pungent odour, even when diluted with air. It is noted for its power of destroying vegetable colours; but as this is only when water is present, and in light, it is supposed to be owing to the decomposition of the water, and the effect ascribed to nascent Oxygen, which combines with colouring matter, the Hydrogen combining with the Chlorine to form Hydrochloric acid. Cold water absorbs about twice its volume. It is also absorbed by alcohol and organic substances; but it generally decomposes them, Hydrochlor′ being formed. It combines with most of the simple bodies and metals, forming Chlorides; with Oxygen and Hydrogen, forming acids. It is incombustible, but partly supports combustion; the flame of a taper becomes red, small, and smoky in it; Phosph. and Antimony take fire in it spontaneously when in a state of division. It is a nonconductor of Electricity. Besides its bleaching properties, it is remarkable for its power as a disinfecting agent, correcting all putrid effluvia from decaying animal and vegetable matters, which depends, probably, upon its great affinity for Hydrogen. It is prepared on a large scale, or may be liberated from one of the officinal compounds.

Prep.—Chlorine is obtained by heating in a retort *Common Salt* 4 parts, *Binoxide of Manganese* 3 parts, and *Sulphuric acid* 7 parts, with an equal weight of *water*, or by the mutual action of *Binoxide of Manganese* and *Hydrochloric acid*, when the Oxygen combines with Hydrogen to form water, one equivalent of Chlorine escapes, and another combines with the Manganese to form Chloride of Manganese; or we may easily obtain it by adding an *acid* to the *Chlorinated Lime* or *Soda* of the Pharmacopœias. It must be collected over warm water, as it is absorbed by cold water, and by Mercury, which combines with it.

Tests.—Chlorine may be known by its colour, by its suffocating smell, and by its bleaching properties. Nitrate of Silver produces a white curdy precipitate (Chloride of Silver) in a solution containing Chlorine. This precipitate blackens in the light, is insoluble in Nitric′, but soluble in Ammonia, and melts into horn silver, *luna cornea*. Solution of Chlorine dissolves gold leaf.

Action. Uses.—Rubefacient. Disinfectant. Suffocating if inhaled.

Antidotes.—Inhalation of Ammoniacal gas with care, and vapour of warm water. See also *Liquor Chlori.*

Off. Prep.—Liquor Sodæ Chloratæ. Calx Chlorata.

Liquor Chlori, B. (Liq. Chlorinii, L.) Solution of Chlorine. *Liquid Oxymuriatic Acid.* *F.* Chlore liquid. *G.* Wässeriges Chlor.

A solution of Chlorine may easily be made by passing into water the gas obtained by any of the above processes. It is liable to be decomposed by light, Oxygen being evolved from the decomposition of the water, and H Cl formed by the combination of the Chlorine with the Hydrogen.

Prop.—This solution has the pale greenish-yellow colour and suffocating smell of Chlorine with an astringent taste. Like the gas, it destroys vegetable colours, and the effluvia of putrefying animal and vegetable substances. These effects may be obtained by exposing the solution to the air, or by the use of chlorinated Soda or Lime.

Prep.—B. Introduce *Black oxide of Manganese* in fine powder, ℥j., into a gas bottle, and having poured upon it *Hydrochloric acid* ℥vj. diluted with ℥ij. of *water*, apply a gentle heat, and by suitable tubes cause the gas which is developed to pass through ℥ij. of water in a wash-bottle, and thence to the bottom of a three-pint bottle containing ℥xxxij. of distilled water, the mouth of which is loosely plugged with tow. As soon as the chlorine ceases to be developed, let the bottle be disconnected from the apparatus, corked loosely, and shaken until the chlorine is absorbed. Lastly, introduce solution into a green glass bottle furnished with a well-fitting stopper, and keep it in a cool and dark place.

The process yields a pure solution of Chlorine. The Cl. gas is dissolved in half its volume of water, and constitutes ·006 of the solution by weight, about $\frac{1}{166}$th part. The solution "immediately discharges the colour of a dilute solution of Sulph. Indigo." Its Sp. Gr. is 1·003. *With 20 grs. of Iodide Potassium dissolved in 1 ounce of water, a fluid ounce (439 grs.), causes a deep red colour (Iodide), which is discharged by 750 gr. measures of the volumetric Sol. Hyposulphite Soda, indicating 2·66 grs. of Chlorine.* (B.)

Tests.—See *Chlorine.*

Action. Uses.—Irritant poison. Caustic. When diluted, stimulant, either internally or as a lotion or gargle. It seems to have an alterative action in the blood, and it is thought probable that the active medicinal properties of Aqua Regia are due to the Chlorine which it contains. Cautiously used, it acts as an antidote in poisoning by Hydrocyanic′ and Sulphuretted Hydrogen.

It is employed in testing for Iodine, and is used in the recognition of Morphia and Quinia. If to a solution of Sulphate of Quinia be added, first some fresh Chlorine water, and then Ammonia, it turns green. A solution of Acetate of Morphia treated in the same way becomes brown; but this colour is destroyed by excess of Chlorine.

Dose.—ʒj.–ʒiv. in f℥viij. of vehicle, or as a lotion or gargle in 8 parts of fluid.

Antidotes.—Magnesia, Chalk, Soap, Albumen, White of Eggs, Dilution.

Vapor Chlori, B. Inhalation of Chlorine.

Prep.—Put *Chlorinated Lime*, ℥ij., into a suitable apparatus, moisten it with *water*, and let the vapour which rises be inhaled.

Introduced in 1867. Chlorine gas is evolved, which removes the odour of fœtid exhalations in putrid sore throat, diphtheria, and cases of foul breath.

Chlorine and Oxygen.

Like the other elementary bodies, Chlorine unites with Oxygen, and in several proportions; but as none are mentioned in the Pharmacopœias, it is unnecessary to do more than advert to these compounds. The highest oxidised of them is the Perchloric Acid. Chloric Acid consists of 1 Eq. Chlorine + 5 Eq. Oxygen; the salts are termed Chlorates. Of these the Chlorate of Potash is officinal. See Potassium.

Chlorine and Hydrogen.

Hydrochloric Acid Gas. Muriatic Acid Gas.

Hydrochloric or Muriatic acid gas ($HCl = 36{\cdot}5$) is a compound of Hydrogen and of Chlorine. It is sometimes found in a gaseous state in the neighbourhood of volcanoes. Combined with Ammonia, it is found in the cracks and fissures of lava, and in the cool parts of brick-kilns in India.

In its pure form it exists as a colourless gas with a pungent suffocating smell, acid taste, reddening vegetable blues, and making Turmeric paper brown. It has been reduced to a liquid state by cold, and by a pressure equal to 40 atmospheres at 50° F. Heat has no effect upon it. It extinguishes all burning bodies immersed in it. It has so great an affinity for water, that it attracts it from the atmosphere, producing the appearance of fuming. 100 C. I. of the gas weigh 39·77 grs.; Sp. Gr. 1·283. Water at 40° takes up 480 times its own volume of gas, and thus forms liquid Hydrochloric acid. It may be obtained by the direct union of its constituents, or by any of the methods described below.

Action. Uses.—Suffocating, but sometimes used as a Disinfectant.

Acidum Hydrochloricum. Hydrochloric Acid. Muriatic Acid. Chlorhydric Acid. *Spiritus Salis. Spirit of Salt. Marine Acid. F.* Acide Hydrochlorique. *G.* Salzsäure, Chlorwasserstoffsäure.

This acid is a solution of the above gas in water. Geber and the Arabs were probably acquainted with it, and the Hindoos knew it by a name equivalent to *Spirit or sharp water of Salt.* The commercial acid is always of a yellow colour. It commonly contains as impurities a little Sulphuric acid, Nitrous acid, Perchloride of Iron, Chlorine, and Bromine. It is prepared by pouring the Oil of Vitriol of commerce on Common Salt in earthen or iron vessels, especially since the extensive manufacture of Carbonate of Soda from Sulphate of Soda. Its Density is about 1·180. For the Properties and Tests, see *Acidum Hydrochloricum*, B.

Acidum Hydrochloricum, B. Acidum Muriaticum Purum.

Prop.—It emits suffocating fumes. When pure, it is perfectly colourless, but is usually of a pale yellowish straw-colour, from the presence of a little Chlorine formed from the decomposition of the acid, when long kept, especially if exposed to light. It has a sour, irritating, and corrosive taste, with the odour of its gaseous acid. When heated to 112° it bubbles, from the quantity of $H\,Cl$ gas which escapes. It freezes at – 60°. $H\,Cl$ combines with water in all proportions, with the evolution of heat. Sp. Gr. 1·16, when it contains 31·8 per cent. by weight of Hydrochloric acid gas.

The action of this acid on some substances, as the Metals, Oxides, &c., requires attention, from the changes which take place in the various decompositions. Thus, when Zinc or Iron are acted on by liquid Hydrochloric′, Hydrogen is evolved in consequence of the decomposition of the acid, and the Chlorine, combining with the metal, forms a Chloride of Zinc or of Iron. But if an oxide of a metal be acted upon, no Hydrogen is evolved, because it combines with the Oxygen of the Oxide to form an equivalent of water, while the metal and Chlorine combine to form a metallic Chloride. Ammonia being a substance devoid of Oxygen, no decomposition of the acid takes place, and it therefore unites with the Ammonia to form Hydrochlorate of Ammonia. The same thing takes place with a vegetable alkali, though it does contain Oxygen, but no action is considered to take place between it and the Hydrogen, and therefore the $H\,Cl$ combines with the alkali, and forms a Hydrochlorate, as that of Morphia.

Prep.—B. Take of *Chloride of Sodium*, dried, ℥xlviij ; *Sulphuric acid*, f℥xliv.; *Water*, f℥xxxvj.; *Distilled water*, f℥l. Pour the Sulphuric acid slowly into ℥xxxij. of the water; and when the mixture has cooled, add it to the Chloride of Sodium, previously introduced into a flask having the capacity of at least one gallon. Connect the flask by corks and a bent glass tube with a three-necked wash-bottle, furnished with a safety tube, and containing the remaining ℥iv. of the water; then, applying heat to the flask, conduct the disengaged gas through the wash-bottle into a second bottle containing the distilled water, by means of a bent tube dipping about half-an-inch below the surface, and let the process be continued until the product measures ℥lxvj., or the liquid has acquired a specific gravity of 1·16. The bottle containing the distilled water must be kept cool during the whole operation.

In the above formula both the Chloride of Sodium and the water are decomposed. The Chlorine of the former, combining with the Hydrogen, forms Hydrochloric′, while the Oxygen of the water unites with the Sodium to form Soda, which is seized upon by the Sulphuric acid to form Sulphate of Soda, which remains as the residual salt, and will be a Bisulphate of Soda if an excess of acid has been employed.

Tests.—The presence of strong Hydrochloric′ is indicated by the dense white fumes which are produced in the neighbourhood of Ammonia; also by Nitrate of Silver producing in a solution containing it a white curdy precipitate (Chloride of Silver): this blackens in the air, is soluble in a solution of Ammonia, but is insoluble in Nitric′. Sp. Gr. 1·16 (same as L. P.). It is rather weaker than the acid of the B. P. 1864, which had Sp. Gr. 1·17, and contained 34·2 per cent. of acid. If pure, it is colourless. Strips of gold are not dissolved in it, even with the assistance of heat; neither is Sulphate of Indigo decolorised; showing in both cases the absence of free Chlorine and of Bromine. After testing with gold leaf, a solution of Protochloride of Tin may be added. If any gold has been dissolved, it will cause a dark precipitate. The acid ought to be entirely dissipated by heat, without leaving any residue. Chloride of Barium gives no precipitate, if Sul′ and Sulphates are not present, but the acid should be diluted before applying this test. H S gas does not throw down anything, showing the absence of metals and metallic oxides. "Bright copper foil is not tarnished when boiled with it, showing absence of Arsenic" (q. v.) Nitrous acid or binoxide of Nitrogen (*see* Pereira) may be recognised by the Protosulphate of Iron.

114·8 *gr. by weight, in* ½ *oz. dist. water*=1000 *measures of volumetric Sol. Soda.* (B.)

Action. Uses.—The strong acid is a corrosive poison, but may be applied externally as an Escharotic. When diluted it is used topically as a gargle to relaxed or putrid sore throat. Internally, it may be given (dilute) to act generally as an acid, but it possesses no astringent power. As this acid has been discovered in the natural gastric juice, it is often proposed for use in morbid conditions of that secretion, especially when there is a deficiency of acid in it. Hydrochloric acid may be used in Phosphaturia; it has been employed by some in Putrid Fevers; and it may be given as an Alterative in the same cases as Nitric acid, doing most good when combined with the latter, so as to form Nitro-muriatic acid. As is the case with the other mineral acids, the dilute acid only is employed for internal use, and this requires still further dilution with water when prescribed.

Antidotes.—Magnesia; solution of Soap, as easily procurable; the Bicarbonates of Soda and Potash; Milk; Demulcents. Chalk to be avoided on account of the deleterious effects of Chloride of Calcium.

ACIDUM HYDROCHLORICUM DILUTUM, B. Dilute Hydrochloric Acid.

Prep.—Take of *Hydrochloric acid*, f℥viij.; *Distilled water*, a sufficiency. Dilute the acid with ℥xvj. of the water, then add more water, so that at a temperature of 60° it shall measure f℥xxvjß. Or as follows:—Take of *Hydrochloric acid*, gr. 3060; *Distilled water*, a sufficiency. Weigh the acid in a glass flask the capacity of which, to a mark on the neck, is Oj., then add distilled water until the mixture, at 60° temperature, after it has been shaken, measures a pint.

This agrees with the dilute acid of the late Edinburgh Pharmacopœia, and is rather stronger than that of L. and D. Sp. Gr. 1·052.

345 *gr.* = 1000 *measures volumetric Sol. Soda.* This corresponds to 10·58 per cent. of real acid. As with the other dilute acids, fʒvj. (345 gr.) contain one equiv. of H Cl (36·5 gr.)

Dose.—♏ x.–♏ xx. in some bland or sweetened fluid or bitter infusion. fʒj. with ℥j. of Honey may be applied with a brush in ulcerated sore throat.

Inc.—Alkalies, most Earths, Oxides, and their Carbonates; Sulphuret of Potassium; Tartrate of Potash; Potassio-Tartrate of Antimony; Nitrate of Silver; Acetate of Lead.

Acidum Nitro-Hydrochloricum.

Nitro-hydrochloric Acid. Nitro-muriatic Acid. Aqua Regia. *F.* Eau régale. *G.* Königswasser.

This acid is made by mixing Nitric′ with Muriatic′, and has probably been known since the discovery of these acids. The Arabs must have been acquainted with it, as they had a solvent for gold.

Prop.—Nitrohydrochloric′ is of a golden yellow colour, with the suffocating odour of Chlorine, and the irritant corrosive properties of the strong acids.

Prep.—Mix pure *Nitric′* 1 part by measure, with pure *Muriatic′* 2 parts, in a green glass bottle, furnished with an accurately ground stopper, and keep in a cool place. It was officinal in the D. P.

The resulting acid is not a mere mixture of the two acids, for both become decomposed. The Nitric′, which so readily parts with its Oxygen, gives 1 Equivalent which combines with the Hydrogen of the Hydrochloric′, and some water is thus formed. Of the Chlorine set free, some escapes, the rest remains in solution with the Nitrous acid formed; but an excess of either of the acids may remain, according to the proportions in which they are used. M. Gay-Lussac considers Aqua Regia to be a combination of Nitric Oxide and Chlorine, in the proportion of 1 Eq. of the former to 2 of the latter gas. When exposed to light, a portion of the water becomes decomposed, and Hydrochloric acid is again formed.

Tests.—It is distinguished by the property of dissolving gold, which is owing to the presence of Chlorine. Nitrate of Silver produces a precipitate of Chloride of Silver, which is soluble in Ammonia, but insoluble in Nitric′. When an Alkali is added, both a Chloride and a Nitrate are formed.

Acidum Nitro-hydrochloricum dilutum, B. Dilute N. H. Acid.

Prep.—B. ℥iij. of *Nitric* and ℥iv. of *Hydrochloric acid*, with ℥xxv. *Distilled water* (The Nitric acid of the B. P. being now weaker, ℥iij. are used instead of ℥ij. as in 1864.)

Tests.—Sp. Gr. 1·074. 6 *fluid drachms* = 920 *measures of volumetric Sol. Soda.* (B.)

Action. Uses.—Corrosive poison. When diluted, stimulant of the skin and of the liver. It is given internally in cases of lithic or oxalic deposit from the urine. A simple mineral acid would be inadmissible in both of these cases. The free Chlorine is probably the efficient ingredient.

Dose.—♏v.-♏xx. well diluted. Applied externally by sponging, or in a foot-bath of warm water, which is made of the acidity of vinegar, or in the proportion of f℥j.-f℥ij.—of the strong acid to each gallon of water.

CARBON.

CARBO′ *Carbonium.* *F.* Charbon. *G.* Kohlenstoff.

Carbon (C=6) is very extensively diffused in nature, as in Coal, Anthracite, Graphite, &c.; of great purity, and crystallised in the form of the regular octohedron or cube, in the Diamond. It forms a large portion of both vegetable and animal substances. Combined with Oxygen, it exists in the Atmosphere and in many mineral waters as Carbonic acid gas, and as a Carbonate in immense quantities in Chalk, Marble, Limestone, &c.

GRAPHITE, called also Plumbago and Black Lead, is found in primary mountains, and is nearly a pure form of Carbon. It has sometimes been considered a Carburet of Iron, but the presence of this metal is not essential; some specimens contain hardly a trace, and others as much as 5 per cent. of Iron. It is sometimes crystallised in six-sided prisms or tables, with Sp. Gr. of nearly 2·5, opaque, steel-grey, solid, with a metallic lustre, soft to the touch, and well known from its property of marking paper. The best specimens are obtained from Borrowdale in Cumberland.

Graphite used to be employed in medicine; internally for many of the same purposes as Charcoal, and externally as an ointment in some skin diseases.

CARBO LIGNI, B. Wood Charcoal.

Prop.—Charcoal is the form in which Carbon is usually seen. Its black colour and freedom from taste and smell are well known. It has never been decomposed, is insoluble, infusible, and unalterable. Sp. Gr. various. It is a bad conductor of heat, but an excellent one of electricity, and is remarkable for its power of counteracting putrefaction, and also for combining with and removing the odorous and colouring principles of most bodies. This is probably owing to its absorbing the odoriferous effluvia, as it does several of the gases, as Sulphuretted Hydrogen and Carbonic acid gas. Charcoal readily burns in air, emitting light and heat, combining with its Oxygen and forming Carbonic acid gas. It yields more heat than an equal quantity of wood, in consequence probably of being freed from the large proportion of water which wood contains. It is in light masses, which retain much of the shape and texture of the wood from which it was obtained. By the heating of coal in close vessels, Charcoal is obtained in the form of Coke.

Prep.—Wood Charcoal is obtained by burning wood in covered-up heaps or in close vessels. "Wood charred by exposure to red heat without access of air." B.

As the combustion takes place with only a limited supply of air, little of the Carbon of the wood is consumed, but its Oxygen, Hydrogen, and Nitrogen escape, variously combined. The Charcoal which remains necessarily contains the ashes of the plant, consisting of Carbonates of Potash, Lime, &c., which should not exceed 2 per cent. (B.) Wood yields from 14 to 23 per cent. of Charcoal. A pure Charcoal may be obtained by burning Oils and Resins with a deficient supply of Oxygen, when, the volatile matters being dissipated, the Charcoal is left, and commonly called *lamp-black*. For medical purposes either kind may be ignited in a close vessel to a red heat, until all volatile matters have escaped. The Charcoal, when cool, is kept in stoppered bottles. It may be very conveniently made into biscuits with some flour.

Action. Uses.—Antiseptic and Disinfectant; corrects the fœtor of the breath and of the stools in Dyspepsia and Dysentery. Dr Stenhouse has lately recommended the use of a Respirator packed with coarsely powdered wood-charcoal, to those who are exposed to noxious smells and pestilential effluvia. Not only does the charcoal absorb and retain these, and so prevent them from passing into the lungs, but by its great affinity for oxygen it tends to bring this in contact with the putrid or noxious emanation, and by decomposing the latter it may obviate infection.

Dose.—Gr. x.–ʒj. internally; ʒj. or ʒij. to Lard ℥j. as ointment.

Cataplasma Carbonis, B. Wood-charcoal ℥ß., is half of it stirred in, the remainder sprinkled on the surface of a poultice made with ℥ij. of bread and ℥jß. linseed meal. It is applied warm to foul ulcers to destroy the fœtor.

Carbo Animalis, B. Animal Charcoal. Bone Black.

This is obtained impure by subjecting bones, horns, muscles, &c. to a red heat in close vessels, until vapours cease to be emitted. The residue, after being powdered, is known by the names of *bone-black* and *ivory-black*. In this state it contains 88 per cent. of Phosphate of Lime (q. v.) and Carbonate of Lime, 2 per cent. of Carburet with Siliciuret of Iron, and a trace of a Sulphuret. It is bitterish in taste, and may readily be distinguished from Vegetable Charcoal by burning a little of it on a red-hot iron, when a large residue is left. The ashes, consisting chiefly of the Phosphate of Lime, are with difficulty acted on by Sulphuric acid; those of Wood Charcoal, being composed of Carbonates, &c., dissolve, and form bitter solutions. Animal Charcoal is officinal on account of its attraction for the colouring matter of organic substances, a property probably owing to its extreme subdivision, and to the extent of surface which it exposes to any liquid filtered through it. The decolorising power of Vegetable Charcoal may be increased by mixing Chalk or pounded flint with the vegetable matter previous to its being carbonised. Animal Charcoal is extensively employed in the arts for removing the colouring matter of Syrup, used also in the preparation of Citric and of Tartaric Acid, and of the vegetable Alkalies and their salts, as Quinia, Morphia, Veratria. The same quantity of Charcoal may be used several times, but it requires to have been first dried and subjected to a red heat. It is either mixed or boiled with the liquid to be decolorised, or the latter is allowed to filter through a layer of Charcoal. For some purposes it requires to be purified.

CARBO ANIMALIS PURIFICATUS, B. Purified Animal Charcoal. Purified Ivory-Black.

Prep.—A pure kind of charcoal may be obtained by the carbonisation of bullocks' blood by heat,—the product being well washed, L. The B. P. directs that common Ivory-Black, ℥xvj., be digested for two days in Hydrochloric acid ℥j. and a pint of distilled water at a moderate heat, then copiously washing with water, drying it and heating to redness in a covered crucible.

The H Cl dissolves the Phosphate and decomposes the Carbonate of Lime, as well as any Sulphuret, with the disengagement of Carb′ gas, and some Sulphuretted Hydrogen, Chloride of Calcium being left in solution. When the residuum has been thoroughly washed, it contains only a Carburet of Iron and some Silica mixed with the Charcoal. The subsequent heating to redness is not to be recommended, as Dr Stenhouse finds that it makes the charcoal compact, and destroys its decolorising power.

It completely decolorises a dilute tincture of Litmus, and when burnt with free access of air leaves scarcely any residue.

Action. Uses.—Animal is more active than Vegetable Charcoal, probably because more finely divided. It possesses a singular power of absorbing and retaining certain gases, especially those which are contained in the offensive exhalations of organic decomposition. Thus this substance forms a valuable and innocuous deodoriser for the sick-room. It may be applied to foul sores to remove their odour, and thus improve their character. Given internally in Dyspepsia, Diarrhœa, and Dysentery, it may remove a cause of irritation by absorbing acrid materials in the intestinal canal.

It is, however, chiefly employed by the Pharmaceutist as a decoloriser. It unites tenaciously with vegetable colours, and is employed to remove these during the preparation of the alkaloids and other active principles of drugs. But it is open to the serious objection that it tends also to combine with the alkaloid itself, and may remove it from the solution as well as the colouring matter (*see* Aconitia). Thus Animal Charcoal has been shown to be a valuable remedy in many cases of poisoning, as, if given immediately, it absorbs and renders inoperative the most powerful alkaloids, and even Hydrocyanic acid. About half an ounce is sufficient to neutralise each grain of Morphia or Strychnia. It is not so efficacious with the mineral poisons. (P. J. ix. 78.)

Carbon and Oxygen.

Carbon and Oxygen form several compounds, which are important to be known on account of their properties, though all are not officinal.

Carbonic oxide ($C\,O = 14$), which is interesting as a compound radical, is a colourless gas, without taste or smell, but extremely poisonous when respired. Sp. Gr. ·972.

It is formed when Carbon is burned with a limited supply of Oxygen. Though it extinguishes burning bodies, it will itself burn with a pale blue flame, as may often be seen on the surface of a coal fire. It is also formed when charcoal is slowly burned, and is necessarily deleterious in close apartments. Professor Dumas states, that it is much more dangerous than Carbonic acid, and that an admixture with the air of $\frac{1}{200}$th part will prove fatal. Fresh air and its forced inhalation, or that of Oxygen, will be the best remedies for this.

Oxalic acid is a compound of 2 Eq. Carbon with 3 Eq. Oxygen, and has been called Carbonous acid. It might be treated of here, but being derived exclusively from organic sources, and closely resembling the other Vegetable acids, will be considered along with them.

Acidum Carbonicum.

Carbonic Acid. *F.* Acide Carbonique. *G.* Kohlen säure. *Fixed Air. Aerial Acid. Spiritus lethalis. Choke Damp.*

Carbonic acid (C' or $C\,O_2 = 22$), so named from being a compound of Carbon and Oxygen, has long been known from its effects; but its nature was not explained until 1757 by Dr Black. It is abundantly diffused in nature, being a constituent of the atmosphere to the extent of $\frac{1}{1000}$th part. It issues from the earth in many situations, as the Grotto del Cane in Italy, and the Valley of Poison in Java; but especially in Germany, near the Lake of Laach, where Bischoff calculates that not less than 600,000 lbs. escape daily, and in such quantities in the Brohltahl as to enable him to employ it in some chemical operations. It issues also, combined with water, from many mineral springs, giving to them their sparkling brilliancy. It is by an excess of Carbonic acid that the Carbonates of Lime, Magnesia, and Iron, are held in solution in different waters. It is formed in large quantities in the combustion of charcoal, &c., and during fermentation. It is always being exhaled by animals in the process of respiration, and in small quantities by plants at night or in the shade. Combined with bases, it exists in large quantities in the interior of the earth, and in the mountain masses of Marble, Limestone, Chalk, &c.

Prop.—Carb′, at ordinary temperatures, exists as a colourless gas, of which the solution in water has an acid taste. It is very heavy: Sp. Gr. 1·52; 100 C. I. weigh 47·25 grs. Water dissolves its own volume, but may be made by pressure to take up a much larger quantity, when it will redden vegetable blues, but not permanently, as the acid escapes when exposed to the atmosphere. When subjected to great pressure, it has been reduced to a liquid state; and, by the effect of great cold, produced by its evaporation, it has been converted into a solid at – 148° F. Carb′ gas extinguishes flame and all burning bodies, except Potassium: it is also fatal to animal life.

Prep.—It may be obtained from *Chalk* rubbed to powder and mixed with water to the consistence of a syrup, upon which *Sulphuric′* is then poured, diluted with an equal weight of water. It may also be obtained from coarsely powdered Marble, or any other carbonate, by the action of the diluted hydrochloric, or any other acid. Whenever the C′ is required for Therapeutical use, it is preferable to employ the S′, as not volatile.

Tests.—Carbonic acid may easily be detected by its evanescent action in reddening Litmus paper, by rendering Lime water turbid, by precipitating Lime and Barytes from their solutions, and by these precipitates being soluble in Acetic acid with effervescence.

Action. Uses.—Acts as a stimulant when taken into the stomach, but is fatal to animal life when breathed. It may be prescribed in the forms of Liquor Potassæ effervescens, Liquor Sodæ effervescens, and in all effervescing draughts, or as Carb′ water, or ordinary bottled Soda water, which very often contains no alkali; or in some mineral waters, which are natural solutions of C′ in water usually containing also other impurities. Death has frequently occurred from breathing this gas in descending into cellars, wells, mines, &c.; also from sleeping near brewers' vats, lime-kilns, in green-houses, or in small apartments, or in cabins on board ship with a charcoal fire. It is a narcotic poison, and produces also a spasm of the glottis. Externally Carb. acid seems to act as an anæsthetic, and baths of the gas have been used by continental physicians in dysmenorrhœa, cancer, and other painful disorders.

HYDROGEN AND SULPHUR.

ACIDUM HYDROSULPHURICUM, B. (Appendix). Sulphuretted Hydrogen. Hydro-Sulphuric Acid. *Hydrothionic Acid.* *F.* Acide Hydro-Sulfurique. *G.* Schwefelwasserstoffsäure.

Hydrosulphuric acid ($H\ S=17$) is remarkable for its offensive odour and deleterious properties.

Prop.—It is a colourless gas. 100 C. I. weigh 36 grs. Sp. Gr. = 1·177. It has been reduced to a liquid form by a pressure of 17 atmospheres. It is inflammable; Sulphurous acid and water being produced. Water absorbs about 2½ times its own bulk, acquiring the taste and smell of the gas, as well as its acid property of reddening Litmus. On exposure to the air $H\ S$ escapes, and the water becomes muddy from the deposition of Sulphur.

It combines with bases, and forms Hydrosulphates, as that of Ammonia; or Sulphurets, some of which, as those of Lead, Copper, Bismuth, and Silver, are blackish-coloured; that of Antimony, red; Zinc, white; Arsenic, yellow. Much useful information is obtained by employing H S or a soluble Hydrosulphate, as of Ammonia or of Potash, as a test, especially as it does not precipitate the Kaligenous and Terrigenous metals. Sulphuretted Hydrogen is absorbed in large quantities by Charcoal, is exhaled from putrefying animal matter, also from some vegetables, as the Cruciferæ, and likewise from decomposing vegetables generally, when a Sulphate is present, from "the decomposition of the Sulphates in water by the Carbonaceous matter of vegetables," * and from some mineral waters.

Prep.—H S may be obtained by the action of *Sul'* 7 parts diluted with *Aq.* 32 parts, poured on *Sulphuret of Iron* 5 parts. In applying it as a test, the sulphuret is mixed with the water, and the acid added in small quantities as the gas is required.

Action. Uses.—Most deleterious when respired, even when much diluted. Mineral waters, either natural (as of Harrowgate) or artificial, taken internally, or used externally in the form of a bath, are stimulant, especially to the functions of the skin and of the uterine system. H S is much used as a test, for which purpose it is included in the Appendix of the B. P. It should be freshly prepared. The gas should be passed first through the water in a washing-bottle to free it from accidental impurity, and then directly into the liquid to be tested. The Solution tested should first be rendered acid. When this is the case the Proto-salts of Zinc, Iron, and Manganese are not precipitated. Black or dark-brown Precipitates are formed in solutions containing Copper, Lead, Tin, Mercury, Gold, Silver, and Bismuth; white with persalts of Iron; yellow with Arsenic; and orange with Antimony. The earthy and alkaline bases are unaffected.

Antidotes.—Inhalation of Chlorine, and Acids taken internally.

HYDROGEN AND CARBON.

Compounds of Hydrogen and Carbon are usually denominated Hydrocarbons. Of these few are officinal, though we require to be acquainted with the properties of others, as they are deleterious. Thus, of those which are gaseous, the two following form the principal ingredients of Coal-gas. Besides these, Bisulphuret of Carbon, Ammonia, and Benzole are present in common Coal-gas, and give it its characteristic odour.

LIGHT CARBURETTED HYDROGEN ($CH_2=8$). This gas is composed of 1 Eq. of Carbon and 2 of Hydrogen—that is, it is a Bihydruret of Carbon. It may be seen escaping in bubbles from the surface of stagnant pools, and also in stirring up fœtid mud, being formed by the decomposition of vegetable matter. It issues sometimes in immense quantities from fissures in Coal-mines, and, mixing with the Oxygen of the Air, forms the fatally explosive *Inflammable Air* or *Fire-Damp* of Miners. It may also be produced artificially

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* Professor Daniell.

from the decomposition of Acetates. It burns with a yellow flame, and may be respired: as Carb' and Water are the results of its combustion, a deleterious atmosphere is necessarily produced.

OLEFIANT GAS ($C_2H_2=14$), named from forming an oily liquid by combining with Chlorine, is a gaseous compound of 2 Eq. of Carbon and 2 of Hydrogen. Like the former, this gas is found in Coal-mines, and may be made artificially by heating strong Alcohol with 5 or 6 times its weight of Oil of Vitriol. It is not respirable, extinguishes flame, but burns with a brilliant white light.

Paraffine oil, obtained by the distillation of coal, is stated by Professor Hofmann to be a "liquid olefiant gas." It is largely used in illumination.

Other Hydrocarbons are either solid or liquid. PETROLEUM or Rock Oil was till lately officinal; and NAPHTHA, whether obtained artificially or as a product of nature, is often used medicinally. As these natural products are considered to be produced by fossil vegetable remains, and as the artificial products are obtained by the decomposition of vegetable matter, it will be convenient to treat of all of these nearly allied substances together. So also of Oil of Turpentine, Tar, and the products of the distillation of Coal. (*See* CONIFERÆ.)

CREOSOTE has been so named from its property of preserving meat from decay: it is a compound of Carbon, Hydrogen, and Oxygen. As it is obtained from Tar, it will most fitly be treated of with that substance.

CARBON AND NITROGEN.

These two elementary substances combine together, and form a very remarkable body, called Cyanogen, from κυανος, *blue*, it being a principal ingredient of Prussian Blue. (See *Sesquiferrocyanide of Iron.*)

CYANOGEN. *F.* Cyanogène.

Cyanogen (Cy or $C_2N=26$) may be obtained by heating Bicyanide of Mercury: it is a colourless gas, of a peculiar and pungent smell, like that of peach-kernels, burning with a purplish flame, readily absorbed by water, and condensible into a colourless liquid. But it is chiefly interesting as, though being a compound body, it acts like the simple elements in combining with metals, and forms with Hydrogen an acid, the HYDROCYANIC, which is of fearful importance on account of its rapidly deleterious effects. As Cyanogen is the type of the compound *radicals* which present themselves in Organic Chemistry, and as Hydrocyanic acid is produced naturally by some plants, it will be treated of with Laurel water under AMYGDALEÆ.

TERNARY COMPOUNDS.

Ternary compounds abound in the Organic Kingdom, and many of them are officinal. Such compounds of Carbon, Oxygen, and Hydrogen, as Starch and Sugar, are most naturally treated of with the plants which yield them. Wines, Alcohol, and kindred bodies, connected with the Saccharine fermentation, being strictly neither inorganic nor organic substances, but products of the latter, will be treated of separately at the end of the work. Also Etherification, or the produce of the action of acids on Alcohol, with the latter substance. Acetous Fermentation and the production of Vinegar are too closely allied to be separated from the consideration of Fermentation in general.

VEGETABLE ACIDS.

Having to notice the salts of these acids with the alkalies, earths, and metals, it would in some respects be preferable to treat of them here. But, as the account of each may be referred to, it is desirable to adhere to the plan adopted with the vegetable alkalies—that of treating of the products with the Plants yielding them. Thus,

CITRIC ACID will be treated of with Citrus, under AURANTIACEÆ.
TARTARIC ACID under the Grape Vine, in AMPELIDEÆ.
OXALIC ACID with OXALIDEÆ.
BENZOIC ACID with Benzoin, under STYRACEÆ.
SUCCINIC ACID with Amber, among FOSSIL PRODUCTS.
TANNIC ACID and GALLIC ACID with Oakgalls, under AMENTACEÆ.

NITROGEN AND HYDROGEN.

AMMONIA. Oxide of Ammonium. Volatile Alkali. *F.* Ammoniaque. *G.* Ammoniak.

Ammonia ($NH_3 = 17$), or Oxide of Ammonium ($NH_4O = 26$), was probably known to Pliny, as he mentions the strong odour evolved from the mixture of Lime and *Nitrum*.[*] The Hindoos also were acquainted with the Carbonate, and obtained it by mixing Sal Ammoniac 1 part and Chalk 2 parts. The name is derived from Sal Ammoniac, from which it was formerly obtained. The solution in water was known to the earlier Chemists, and called by them Volatile Alkali. It was first obtained as a Gas by Priestley. (Experiments on Different Kinds of Air, 1774.) In 1756, Dr Black distinguished it from its Carbonate, though Berthollet was the first to communicate precise ideas respecting its composition, which was determined by Gay-Lussac. Ammonia exists at all times in small quantities in the air, as Carbonate (about $\frac{1}{1000000}$th part), and therefore in rain-water, and is also contained in the juices of most plants, as the Birch, Beetroot, Sugar, &c. It is the chief source of the Nitrogen in plants, and is generally evolved during their decomposition. It is abundantly produced during the putrefaction of animal matter, and, in combination with Phosphoric′ and Hydrochloric′, exists in Urine. With heat and moisture, Urea (which is isomeric with Cyanate of Ammonia) is decomposed, Carbonate of Ammonia being formed. Some of its salts, as the Carbonate and Nitrate, are contained in mineral springs, as in those of Greiswolde and Kissingen ; the Hydrochlorate and Sulphate (Mascagnin) are found in the neighbour-

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[*] Probably Sal Ammoniac, as several substances were included under *Nitrum*.

hood of Volcanoes and near ignited Coal-seams. Dr Austin ascertained that if nascent Hydrogen were presented to gaseous Nitrogen, Ammonia was formed. (Phil. Trans. vol. lxxvii. p. 379.) M. C. S. Collard has also some time since (Jour. de Chim. Méd. iii. 516) pointed out that this gas is formed during the contact of water and air wherever nascent Hydrogen and Nitrogen come in contact; and that thus it is produced daily in immense quantities, giving rise, it is supposed, by its further oxidation, to the Nitrates which stimulate Vegetable life. (*Dict. de Mat. Med.* Merat & De Lens, i. p. 255.)

Prop.—Ammonia, when pure, is a colourless transparent gas, with a pungent suffocating odour, having alkaline and caustic properties. It browns Turmeric paper, and restores the blue colour of vegetables reddened by acids; but these effects are transient from its volatility. It may be obtained by acting with caustic Lime or Potash on Hydrochlorate of Ammonia (Chloride of Ammonium); or by heating a solution of Ammonia, and collecting the gas over Mercury. Its Sp. Gr. is 0·59. 100 C. I. weigh 18·28 grs. By a pressure of 5½ atmospheres at 50° F. it was reduced by Faraday to the state of a colourless transparent liquid, with a Sp. Gr. of 0·76. Water absorbs it with very great rapidity, and to a great extent. (See *Solution of Ammonia.*) Alcohol and Ether also readily dissolve it. Near any volatile acid, especially hydrochloric, it forms a white vapour. Combining with acids, salts are formed, some of which sublime when the acid is volatile; but, when this is fixed, the Ammonia volatilises on the application of heat. It supports neither respiration nor combustion. A mixture of 2 volumes of Ammoniacal gas and 1½ of Oxygen gas may be exploded by the electric spark. Nitrogen is produced, as well as water, proving the presence of Hydrogen. It is composed of 1 Eq. Nitrogen and 3 Eq. Hydrogen, or 1 volume of the former and 3 volumes of the latter compressed into 2 volumes.

Ammonia, with water, may be considered as the oxide of the compound metal Ammonium ($NH_3, HO = NH_4 O$).

If an amalgam of Mercury and Potassium be placed in a solution of Hydrochlorate of Ammonia, the Potassium is displaced, and the Mercury swells up to a great bulk, having combined with this compound metal, Ammonium, NH_4. All the salts of Ammonia may be referred to Ammonium, and will then resemble those of Potassium. Thus Hydrochlorate of Ammonia is the same thing as Chloride of Ammonium.

$$NH_3, HCl = NH_4, Cl.$$

The Sulphate and others always contain 1 Eq. of water; and thus

$$NH_3, SO_3, + HO = NH_4, O + SO_3.$$

Dr Kane considers Ammonia to be a compound of Hydrogen with Amide, NH_2.

Action and Uses of Ammonia and its Compounds.—Ammoniacal gas is a local irritant, fatal if respired alone. The strong solution, applied externally, is caustic and vesicant; internally, it is a corrosive poison. Given diluted, and in proper doses, Ammonia is rapidly absorbed into the blood, and acts upon the system as an Alkali and a Stimulant. It may be given to counteract acidity in Gastralgia, Lithiuria, &c. As a stimulant it acts rapidly, and is thus of use to rouse the system in cases of fainting, or threatened Syncope. The vapour from the solution or from the sesquicarb. may be administered by inhalation through the nostrils, but this requires caution if the patient be insensible. In cases of poisoning by Hydrocyanic Acid, it should be immediately resorted to. Ammonia may be used as an antispasmodic stimulant in Epilepsy and Hysteria, in Flatulence, and Tympanitis; or employed to rouse the Cerebral Functions in Delirium, Cephalalgia, and Typhoid Fevers. Administered in excess, it causes quickening of the pulse, increased perspiration, fulness of the head, and alkalinity of the urine. In a large dose, it irritates the stomach and causes vomiting. The Carbonates resemble in their action the pure Ammonia, but the operation of the salts is very different. The Acetate and the Citrate, like other salines, exert at the first a mild antiphlogistic power; but they are at length decomposed in the blood, and changed into Carbonates, so as to affect the urine like Alkalies. The Acetate is also an active diaphoretic. The Hydrochlorate undergoes no such change; yet it is not a simple saline, but, like the Chlorides of the fixed Alkalies, it possesses an alterative property. It has been much recommended in chronic diseases of the Liver.

Antidotes to Poisoning by the Vapour of Ammonia.—Inhaling vapours of hot Vinegar or fumes of H Cl.

SOLUTION OF AMMONIA.

This is a solution of Ammonia in water. The B. P. has both a strong and a weak solution.

Prop.—Colourless like the gas, with a powerful pungent odour, and acrid alkaline taste. Its density, which is less than that of water, varies with its strength, and is less as the quantity of gas dissolved is greater. Sir H. Davy ascertained that at 50° F. and ordinary pressure, water absorbs 670 times its own bulk of Ammoniacal gas, becoming of a Sp. Gr. = 0·875, when it contains 32·5 parts or about $\frac{1}{3}$ of gas. The lowest Sp. Gr. stated by Dalton is ·850. It freezes about $-40°$ F. Its boiling point differs according to its density, depending chiefly on the escape of gas. Like Lime water, Solution of Ammonia absorbs Carbonic gas from the atmosphere, at the same time that much Ammonia escapes. It combines with acids to form salts; and with Oil it forms Soap, in some officinal liniments. It decomposes a great many earthy and metallic salts, precipitating their oxides, and in some cases redissolving them in an excess of Ammonia; or producing a double salt, as in Ammonio-Chloride of Mercury, Ammonio-Chloride of Iron, &c.

LIQUOR AMMONIÆ FORTIOR, B. Aqua Ammoniæ Fortior. Strong Solution of Ammonia.

Solution of Ammonia is manufactured on a large scale by decomposing with caustic Lime the crude Sulphate or other salts obtained from Gas liquor or Bone spirit (see *Ammoniæ Hydrochloras*). A formula is given for its preparation in the B. P., and it is to be of Sp. Gr. ·891. As this is much stronger than ordinary solution of Ammonia, it is reduced to the strength of Liquor Ammoniæ by adding to every f℥j. of it f℥ij. of water, by which the Sp. Gr. of the mixture becomes ·959.

Liquor Ammoniæ fortior contains 32·5 per cent. of the gas by weight. 52·3 *gr. by weight*=1000 *measures of the volumetric Sol. Oxalic acid.*

Prep.—B. Mix *slaked Lime*, ℔iv., with *Chloride of Ammonium* in coarse powder, ℔iij. Introduce into iron bottle placed in metal pot surrounded by sand; connect by iron tube, &c., with Woolf's bottle holding Oj., a second of same size, thirdly, a matrass capable of holding Oiij., in which are ℥xxij. of distilled water, fourthly, an ordinary bottle containing ℥x. of distilled water. Bottles 1 and 2 are empty. The second and the matrass are furnished with a syphon safety tube with a short column of mercury. Apply to the pot a heat very gradually raised, until gas ceases to pass from the tube in the matrass. This will then contain about ℥xliij. of Liq. Ammon. Fort. (There will be a coloured ammoniacal liquid in 1 and 2, from water which is distilled over with the gas. It is heated until reduced by one-fourth, and the gas utilised by being received into the water of the terminal bottle, which will now have about the strength of Liq. Ammoniæ, B.).

The Chlorine unites with the Calcium of the Lime to form Chloride of Calcium, which remains behind in the retort. The Oxygen of the Lime with the Ammonium forms Oxide of Ammonium, or Ammonia, which distils over.

Solution of Ammonia is manufactured on the large scale by distilling crude Sulph. Ammonia with milk of Lime. The heat must be first moderately applied, and greatly increased toward the end of the process. Mr Lawson states that a still containing one cwt. of the Sulph. requires about 24 hours to work it off, and will produce from 60-70 ℔ of the strongest solution of Sp. Gr. ·875, containing 32·5 per cent. by weight of Ammonia. (P. J. xiv. 452.) This is at variance with the statement in the B. P.

Action. Uses.—Irritant, Vesicant, and Caustic; often employed for *smelling* salts.

LIQUOR AMMONIÆ, B. Weaker solution of Ammonia.

The weaker solution is made by diluting the last with 2 parts of water. The Sp. Gr. of this solution of Ammonia ought to be 0·959, and it is composed of nearly 10 parts of Ammonia and 90 of water. (See Carius on the Strength of Solutions of Ammonia, *Annalen der Chemie und Pharmacie*, xcix. 129).

85 *gr. by weight*=500 *measures of volumetric solution of Oxalic acid.* (B.)

Tests.—Odour, taste, and other properties like the gas. By heat it evaporates in evanescent alkaline vapours, as shown by the transient browning of Turmeric paper. It gives no precipitate (Carbonate of Lime) with Lime water, or with Chloride of Calcium, showing the absence of Carbonic′. It will not effervesce with dilute acids. When saturated with Nitric′, neither Sesquicarb. Ammonia, nor Nitr. Silver throw down anything, proving that no earthy matter, nor

H Cl, nor any Chloride, is present. Chloride of Barium gives no precipitate, showing the absence of Sulphuric acid. Being commonly prepared from gas liquor, or salts obtained from it, solution of Ammonia is apt to contain tarry products, especially one called Pyrole. This is reddened on the addition of Sulphuric acid in excess. When saturated with SO_3, the tarry Liquor Ammoniæ evolves a peculiar odour. Oxalic' will indicate the presence of Lime.

Inc.—Acids, acidulous and most metallic salts.

Action. Uses.—Ammonia and its carbonates are similar in their action. This volatile alkali acts in a concentrated state as a caustic, and in large doses as a corrosive poison. It is employed externally as a rubefacient, and a cure for the bites of insects or even serpents. Internally, it may be applied in solution, properly diluted, to the stomach, or in vapour to the lungs, by inhalation. In either case it is a diffusible stimulant, immediate in its action. It rouses and excites for the moment the brain and nervous system, thus averting a threatened attack of syncope or convulsions. Its action is directly contrary to that of Prussic acid, to which it is the only antidote. This stimulant action is the primary action of Ammonia. Its second operation is that of an alkali. It neutralises acidity in the stomach, primæ viæ, the blood, the secretions. For long use it is less objectionable than potash or soda, but, like them, tends to waste the tissues by dissolving albuminous compounds. In flatulence or pyrosis, with acidity and heartburn, Ammonia is the best medicine. It may be given with advantage in the lithic acid diathesis, in gout and rheumatism. It is expectorant and diaphoretic, and thus of use in coughs. It should be avoided in fevers and low disorders, where there is a tendency to alkalinity or excessive fluidity of the blood. It is contra-indicated in scurvy and hæmorrhagic cases.

Dose.—♏x.-♏xxx. in water, Camphor mixture, Milk, or any demulcent liquid.

Antidotes.—Vinegar, Lemon juice, or Vegetable Acids.

Off. Prep.—Hydrargyrum Ammoniatum. Lin. Camphoræ Co. (strong solution). Lin. Hydrarg. (weaker solution).

SPIRITUS AMMONIÆ FŒTIDUS, B. Fetid Spirit of Ammonia.

Prep.—Take of *Assafœtida*, ℥jß.; *Strong Solution of Ammonia*, f℥ij.; *Rectified Spirit*, a sufficiency. Break the assafœtida into small pieces and macerate it in a closed vessel, in f℥xv. of the spirit for 24 hours, then distil off the spirit, mix the product with the solution of Ammonia, and add sufficient rectified spirit to make 1 pint.

Introduced anew in 1867. A similar preparation in the L. P. contained Carbonate of Ammonia. Used in Hysteria and other nervous disorders of women.

Dose.—f℥ß–f℥j.

The Aromatic Spirit of Ammonia of the E. and D. Pharm., like the above preparation, contained pure Ammonia, instead of the Carbonate, which is contained in the Aromatic Spirit of the B. P., made with the strong solution and the sesquicarbonate.

As an external application, Ammonia may be applied in the form of the following Liniment or Ointment.

Linimentum Ammoniæ, B. Liniment of Ammonia.

Prep.—Take of *Olive Oil*, f ℥iij.; *Solution of Ammonia*, f ℥j. Almond Oil has been recommended as giving a more uniform product.

Rubefacient, Stimulant.

Ammoniacal Ointment.—This is formed by rubbing up Ammonia with fatty matter in proportions according to the effect required. If rubbed on the skin, and the Ammonia allowed to evaporate, rubefaction will be produced, but if confined by a compress, vesication will ensue.

Carbonates of Ammonia.

From the difficulty of distinguishing in the description of old authors the several Carbonates of Ammonia, it is preferable to treat the little that is known of their history together. We have seen that Carbonate of Ammonia is always present in the atmosphere. It is disengaged from decomposing animal remains, and is found in some springs, as well as in the juices of plants. The Hindoos would seem to be acquainted with it, as they have a formula, given by Dr Ainslie, in which they heat together 1 part Sal Ammoniac and 2 parts of Chalk, which must produce a Carbonate of Ammonia. It was probably also, as inferred by Dr Pereira, known to the Arabs. Raymond Lully was acquainted with the impure solution of Carbonate of Ammonia obtained from putrid Urine, and Basil Valentine mentions the Spiritus salis Urinæ.

Three Carbonates of Ammonia are known: the simple Carbonate is contained in the Spiritus Ammoniæ Aromaticus, and Fœtidus (L.); the Sesquicarbonate (common Carbonate of Ammonia) is a solid salt; and the Bicarbonate of Ammonia may also be often found effloresced on the latter.

Carbonate of Ammonia. F. Carbonate d'Ammoniaque.

The Carbonate of Ammonia, which consists of 1 Eq. Ammonia, $17 + 1$ Eq. Carbonic Acid, $22 = 39$, and, if hydrated, of an additional Eq. of Water, $9 + 39 = 48$, may be formed by bringing C' gas in contact with Ammoniacal gas; or by decomposing Hydrochlorate of Ammonia by the Alkaline or Earthy Carbonates, and distilling along with some liquid; or it may by slow evaporation be obtained in a crystalline state. It is contained in the following preparation:—

Spiritus Ammoniæ Aromaticus, B. Spirit of Sal Volatile.

Prop.—It is a colourless, pleasantly fragrant, and agreeably stimulant solution of volatile oils in Ammoniated Alcohol.

Prep.—B. Take of *Carbonate (Sesquicarbonate) of Ammonia*, ℥viij.; strong *Solution of Ammonia*, f℥iv.; *Volatile Oil of Nutmeg*, fʒiv.; *Oil of Lemon*, fʒvj. *Rectified Spirit*, Ovj.; *Water*, Oiij. Mix, and distil seven pints.

Specific gravity, 0·870.

The aromatic spirit of the L. P. was made by distilling Sal Ammoniac with Carb. Potash, Cinnamon, Cloves, Lemon Peel, and Spirit. It turned brown from the presence of Oil of Cloves. It contained the simple Carbonate of Ammonia along with Chloride of Potassium. The Carb. Ammonia only is dissolved in the B. spirit. As the common Carbonate (see below) is a sesquisalt, containing 2 equiv. of Ammonia to 3 of Carb. Acid, another equiv. of Ammonia is presented to it and the neutral carbonate formed. The result of this mode of preparation, and the use of the vol. oils instead of the raw spices, is a more elegant and more efficient medicine, half again as strong as the spirit of the L. P.

Dose.—ʒß–ʒj. May be prescribed with Sulphate of Magnesia.

AMMONIÆ CARBONAS, B.

AMMONIÆ SESQUICARBONAS. *Sal Volatile. Ammonia Præparata.*

The Sesquicarbonate ($2\,NH_4O + 3\,CO_2 = 118$), called simply Carbonate of Ammonia in the B. P., has long been known by various names, as *Volatile** or *Smelling Salts, Salt of Hartshorn, Volatile Salt of Urine,* all of which indicate either its properties, or the sources from whence it was obtained. It is now obtained by the action of the Alkaline or Earthy Carbonates on Chloride of Ammonium (Hydrochlorate of Ammonia), or sometimes on crude Sulphate of Ammonia.

Prop.—Usually met with in colourless translucent cakes; fracture striated, or of a rather fibrous texture; taste sharp, alkaline, ammoniacal; odour pungent, penetrating. On exposure to the air it loses its translucency, becomes friable, and covered with a white powder, Bicarbonate of Ammonia, which is much less pungent, and is called *Mild Carbonate of Ammonia.* This is formed from the escape of a portion of the Ammoniacal gas, or of Carbonate of Ammonia, as is indicated by the discoloration of Turmeric paper held over it. This salt is completely dissipated by heat; is soluble in less than 4 times (twice, Berz.) its weight of cold water, but in boiling water it is decomposed with the evolution both of Carb′ and of Ammonia; soluble also in proof, but sparingly so in rectified Spirit. The composition of this salt, according to Mr Phillips, is as follows:—

3 Eqs. of Carbonic Acid	22 × 3 = 66	or Carb′ .	55·93
2 Eqs. of Ammonia .	17 × 2 = 34	,, Ammonia	28·81
2 Eqs. of Water . .	9 × 2 = 18	,, Water .	15·26
	118		100

But, as observed by Dr Pereira, from the observations of Dalton and Scanlan, this is not a single salt or Sesquicarbonate, but a mixture or compound of the Carbonate and Bicarbonate; for, if treated with a small quantity of cold water, a solution of Carbonate of

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* The best *smelling salts* consist of the neutral carbonate, which may be made by adding to the sesquicarbonate half its weight of strong solution of ammonia.

Ammonia is obtained, while a mass of Bicarbonate remains, having the form and dimensions of the Sesquicarbonate employed. From the uniformity of its composition and its crystalline structure, Dr P. considers it to be a chemical combination of two salts. 1 Eq. Anhydrous Carb. Ammonia 39 + 1 Eq. Hydrated Bicarb. Ammonia 79 = 118 Hydrated Sesquicarbonate Ammonia. According to the most recent view, this salt is a compound of 3 Eq. C′ + 2 Eq. Oxide of Ammonium. It is thus written ($2\,NH_4O, 3\,CO_2$).

Prep.—Take of *Chloride of Ammonium* (*Hydrochlorate of Ammonia*) ℔j. and of *Chalk* ℔jß. Rub them separately into powder. Mix and sublime with a heat gradually raised.

Here a mutual decomposition takes place between the Carbonate of Lime (Chalk) and Hydrochlorate of Ammonia. They exchange acids. On the one hand, Carbonate of Ammonia is formed; on the other hand, from H Cl and Lime (Ca O), Chloride of Calcium and water are produced (Ca Cl + H O). Ca Cl remains in the retort. The Carbonate of Ammonia and the water distil over together. So far all is simple; but a further changes takes place. Instead of a simple Hydrated Protocarbonate, the product is a Sesquicarbonate with 2 Eq. of water. From every 3 Eq. of the former, 1 Eq. of Ammonia and 1 of water escape during sublimation. The change may be thus shown by an equation—

$$3\,(NH_4O, CO_2,) = (2\,NH_4O, 3\,CO_2,) + NH_4O.$$

When exposed to the air it loses an equivalent of the Carbonate of Ammonia, and a Bicarbonate ($NH_3, 2\,CO_2, 2\,HO$) remains.

Sesquicarbonate of Ammonia is sometimes made on a large scale by subliming a mixture of impure Sulph. Ammonia and Carb. Lime. The result is as above, Sulph. Lime being left. The Sulphate of Ammonia being obtained by acting with S′ or Sulph. Lime on the impure Carb. Ammonia of *Gas Liquor*, or that from *Bone Spirit*. It is necessarily impure, and often contaminated with tar or oily matter, and therefore requires to be refined. In the lagoons of Tuscany Sulphate of Ammonia is contained as well as Boracic acid, and a very pure Carbonate is now prepared from that source. (P. J., Nov. 1862.)

Tests.—The salts of Ammonia may be easily recognised by its fumes, which are exhaled when they are rubbed up with Potash. In this salt the odour and tests will at once reveal that alkali, and the Carb′ is known by effervescence with dilute acids. It yields a white precipitate with the Chloride of Calcium or of Barium; the clear liquor from which the latter precipitate (Carbonate of Barytes) has subsided, yields a further precipitate on the addition of Caustic Ammonia. By this last character the Sesquicarbonate is distinguished from the neutral Carbonate. (Per.) This may be explained by considering its compound nature. The Bicarbonate does not precipitate the earthy bases, but the addition of Ammonia converts it into a neutral carbonate. Carb. Ammon. is not very liable to be impure when prepared by the first process. It is translucent in mass, but falls to powder in the air; entirely sublimed and soluble;

changes the colour of Turmeric; when saturated with Nitric′, it does not precipitate with Chlor. Barium, or with Nitr. Silver. If the translucency be impaired, and the salt looks white and powdery, a portion has been converted into the Bicarbonate, a less pungent salt. Anything insoluble or not sublimed is an impurity. The presence of Sulphates, as of Ammonia, will be indicated by the Barytic salts; and any Chloride of Ammonium, by a white precipitate being formed by Nitrate of Silver.

59 *gr. in* 1 *oz. of distilled water are neutralised by* 1000 *measures of the volumetric Sol. Oxalic acid.* (B.)

Action. Uses.—Antacid, Stimulant, Antispasmodic, Diaphoretic. In Fainting; Low states of system; Acid Dyspepsia; Convulsive disorders.

A solution of the Sesquicarb. Ammonia, ½ oz. in 10 oz. of water, is used in the B. P. as a test.

Dose.—Gr. ij.–gr. x. in pills, or in solution.

Inc.—Acids, Acidulous Salts, Alkalies, Lime water, Magnesia; many Metallic salts, but not the Potassio-Tartrate, or Ammonio-Citrate of Iron, or Sulphate of Magnesia.

The Sesquicarbonate of Ammonia is sometimes employed for making effervescing draughts.

20 gr. Sesquicarbonate of Ammonia saturate	f℥vj. of Lemon juice 24 grs. of cryst. Citric acid	forming Citrate of Ammonia.
	25 grs. of cryst. Tartaric acid	forming Tartrate of Ammonia.

AMMONIÆ BICARBONAS.

Bicarbonate of Ammonia ($NH_4O, 2CO_2, HO$) is formed whenever the Sesquicarbonate is exposed to the atmosphere, or even when the bottle in which it is kept is frequently opened. It is sometimes called *Mild Carbonate of Ammonia*, from the Ammoniacal odour and taste being less obvious from combination with a further Eq. Carb′. It crystallises usually in 6-sided prisms, and requires 8 parts of water for solution.

Prep.—Expose on a sheet of paper for twenty-four hours any quantity of the *commercial Sesquicarbonate* well powdered. Enclose it now in a well-stoppered bottle. A carbonate evaporates, a bicarbonate remains.

Tests.—Its solution at first occasions no precipitate with Chlor. Barium or Chlor. Calcium; after a short time, however, the mixture evolves Carb′, and a white earthy Carbonate is precipitated. But it does not precipitate Sulphate of Magnesia.

Action. Uses.—Antacid, Diaphoretic. Being milder, it may be more suitable than the Sesquicarbonate in somes cases.

Dose.—Gr. v.–gr. xx. in *cold* water. For effervescing draughts ℈j. will saturate 18 grs. of Cit′. or 19 grs. of Tar′.

LIQUOR AMMONIÆ ACETATIS, B. Solution of Acetate of Ammonia. *Spirit of Mindererus.*

Acetate of Ammonia ($NH_4O\,Ac' = 77$) may be obtained in crystals in the exhausted receiver of an air-pump; but as it is a deliquescent salt, it is contained in the Pharmacopœia only in the state of a diluted solution.

Prop.—This is limpid, colourless, with a faint smell, and a slight mawkish taste. If neutral, it should produce no effect on Litmus or Turmeric paper. If with a slight excess of acid, it will be less irritant when used as a lotion in some cases; but an excess of alkali may be no objection when exhibited internally.

Prep.—B. Take of *Acetic acid*, f℥x.; *Carbonate of Ammonia*, ℥3¼, or a sufficiency; *Distilled water*, Oijß. Reduce the carbonate of ammonia to powder, and add it gradually to the acetic acid, until a neutral solution is formed, then add the water.

The Acetic acid combines with the Ammonia, and the CO_2 escapes with effervescence. This formula is that of the L. P. of 1851, nearly. The preparation is now restored to its original strength. The Liq. Amm. Acet. (B. 1864) was of Sp. Gr. 1·06, and five times as strong as this. (The original Spirit of Mindererus was formed by saturating strong vinegar with Spirit of Hartshorn; it was thus a solution of Acetate of Ammonia, with some Ammoniacal Soap formed by the action of alkali on the empyreumatic oil of the spirit, which, M. Chaussier observes, added to its efficacy.)

Tests.—Sp. Gr. 1·022, same as the Liq. Amm. Acet., L. P. Action on Litmus or Turmeric paper will detect excess of acid or alkali. It is not coloured by the addition of Hydrosul′, showing the absence of any metallic oxide, especially Copper or Lead; if diluted with water, no precipitate on addition of Nitr. Silver or Chlor. Barium, the first indicating absence of Hydrochloric′ and the second of Sulph′. The water being evaporated, the residue yields Ammonia, and is dissipated by heat; any further residue is an impurity, as both the Acetic′ and the Amm. are volatile. The most usual irregularity is in point of strength, and this should be ascertained by the Sp. Gr.

Inc.—Decomposed by the strong acids; also by Potash and Soda, and by their Carbonates; by Lime and Lime water, Magnesia and Sulphate of Magnesia; also several metallic salts, as of Antimony, the Sesquichloride and Sulphate of Iron, &c.

Action. Uses.—As a Refrigerant Saline in Fevers and Inflammations. Diaphoretic. Refrigerant Lotion and Collyrium.

Dose.—fʒij.–fʒvj. every 3 or 4 hours, in water, or with Camphor mixture, &c.

LIQUOR AMMONIÆ CITRATIS, B. Solution of Citrate of Ammonia.

Citrate of Ammonia ($3\,NH_4O,\ C_{12}H_5O_{11}$) dissolved in water.

Prep.—B. Take of *Citric acid*, ℥iij.; *Strong Solution of Ammonia*, f℥2¾ or a sufficiency; *Distilled water*, Oj. Dissolve the citric acid in the water, and add the solution of ammonia until the liquid is neutral to test papers.

A preparation of the L. P., omitted in B. 1864. Its chemical reactions are those of Citric Acid and Ammonia. It is an excellent saline diaphoretic in fevers and colds, given in the same cases and same doses as the above, but somewhat more pleasant to the taste and less irritating.

AMMONII CHLORIDUM, B.

AMMONIÆ HYDROCHLORAS. Hydrochlorate of Ammonia. Muriate. *Sal Ammoniac.* *F.* Hydrochlorate d'Ammoniaque. *G.* Salmiak.

This salt ($NH_4Cl=54$), or (NH_3, HCl) was known to Geber. Avicenna and Serapion mention it by the name *Noshadur.* Persian writers give *Armeena* as its Greek synonym. The Sanscrit name is *Nuosadur;* Dr Royle obtained it by this name in India, where it is formed in brick-kilns. (*See* Hindoo Med. p. 40.) In Egypt it is obtained from the dung of camels. That it was known to the Romans, is evident from Pliny stating that one of the kinds of *Nitrum* gives out a strong smell when mixed with Quick-lime.

Prop.—It is usually in pieces of hemispherical cakes, of a white colour, without smell, having a saline acrid taste. Its texture is striated and radiated ; it is somewhat tough and ductile, opaque or crystalline and semi-transparent ; nearly permanent in the air, but attracts a little moisture ; some impure varieties, crystallised in conical masses, are deliquescent, from containing Chloride of Calcium. Sp. Gr. 1·450. It is soluble in about its own weight of boiling water, but requires 3¼ times as much at 60°, when it produces considerable cold ; hence it is one of the salts most commonly employed in freezing mixtures. It requires about 5 parts of Alcohol, but less of rectified Spirit, for solution ; when heated, it sublimes without decomposition, and is thus most frequently obtained. When its solution in boiling water is cooled down, it crystallises in tetrahedral prisms terminated by 4 planes, in octohedrons, or in plumose crystals ; the latter are formed "of rows of minute octohedrons, attached by their extremities." (*g.*)

This salt is decomposed by acids and alkalies, the S′ and N′ combining with its Ammonia and setting free HCl ; while Potash, Soda, Baryta, Lime, and Magnesia, set free its Ammonia, which may be recognised by its tests, and unite with the acid forming Chlorides ;—their Carbonates likewise decompose it, forming Carbonates of Ammonia. With Nitr. Silver a white precipitate soluble in Ammonia (Chloride of Silver) is formed, and with Acet. Lead, one of Chloride Lead, also white. With Bichloride of Platinum, a yellow precipitate (Platino-bichloride of Ammonium), which, when collected, dried, and ignited, yields spongy Platinum. It forms an ingredient in Liquor Hydrargyri Perchloridi, B.

Admitting the hypothetical metal Ammonium, and thus bringing the salts of Ammonia into more definite relation with those of the mineral alkalies, this salt is termed Chloride or Protochloride of Ammonium. Dr Kane considers it a Chloro-amidide of Hydrogen.

Chloride of Ammonium may readily be formed by bringing together Ammonia and H Cl gases; and these probably come together in volcanoes, and account for the salt being there found. In Egypt it is yielded by the soot produced by burning the dung of camels and of other animals which feed on the saline plants of the desert. So in N. W. India it is obtained at the unburnt extremity of brick-kilns, where animal manure and refuse straw, &c., are employed as fuel. It is obtained from the destructive distillation of bone, as animal Charcoal is required for the use of Sugar-refiners, the fat and marrow being first removed for the use of Soap-makers. The gelatinous and cartilaginous parts become decomposed, the Nitrogen and Hydrogen form Ammonia, and the Carbon with Oxygen some Carb′, which unites with the Ammonia. This Carbonate of Ammonia, received and consequently dissolved in water, is called *Bone Spirit.* The Carbonate is also obtained in the preparation of Coal Gas, which, being passed through water, forms *Ammoniacal* or *Gas Liquor.* Other salts are also formed. To these H Cl is sometimes added, an impure Chloride of Ammonium obtained, which may be purified by crystallisation and sublimation. By other manufacturers an impure Chloride of Calcium, obtained from Salt-works, is added to the Ammoniacal liquor, when a precipitate of Carbonate of Lime is obtained, and, as before, Chloride of Ammonium in solution; in either case it may be separated and dried by evaporation, and then purified by sublimation. Or these Carbonates may be converted by the addition of Sulph. Acid into Sulphate of Ammonia. From ½℔. to 1℔. of the Cryst. Sulphate may be obtained from each gallon of the Gas liquor. This sulphate is used in the preparation of all the compounds of Ammonia. To form the Chloride, it is to be mixed with Chloride of Sodium. On application of heat, double decomposition ensues, Chloride Ammonium is formed, and, being volatile, is obtained pure by sublimation; Sulphate of Soda remains behind. (For a full account of the processes employed by the manufacturers in the production of Ammonia and its compounds, see Pharm. Journ. xiii. 63 *et seq.*)

Tests.—Sal Ammoniac, as found in nature, is sometimes mixed with Chlor. Calcium, the old Muriate of Lime. This is ascertained by its greater deliquescence, and by the tests for that earth. From the mode of its manufacture, it sometimes contains Iron or Lead. These would be revealed by its not being totally soluble in water, and not being sublimed by heat without residue. It should be colourless and translucent; Chloride of Barium throws down nothing, showing absence of Sulphate of Ammonia. The Lead is usually seen on the discoloured convex surface, when it has been sublimed into a leaden vessel, probably a double Chloride of Lead and Ammonium. A solution of this salt gives a black precipitate (Sulphuret of Lead) when Hydrosulphuric acid gas is passed through it. (Jackson, Med. Gaz. 1839, as quoted by Per.) Iron may be detected by Ferrocyanide of Potassium and a few drops of Nitric′. It is derived from the pot from which the sublimation is conducted.

Action. Uses.—Alterative Saline; Diaphoretic; Refrigerant as a lotion, on account of the cold produced in solution; Discutient. In Liver diseases; Chronic Inflammations.

Dose.—Gr. v.–gr. xxx. 2 or 3 times a-day, with Sugar and Aromatics. As a cold application, equal parts of Nitre and Sal Ammoniac may be employed. ʒij. with Nitre ʒv. will reduce temperature 40°. (A solution of one part in ten of water is used in the B. P. as a test.)

Inc.—Strong acids; Potash, Soda, Lime, their Carb; Acet. Lead.

Sulphate of Ammonia (N H_4O, S O_3), prepared as above, was used in the B. P. (1864) in the purification of Sulphuric acid. (q. v.)

AMMONII BROMIDUM, B. Bromide of Ammonium.

The Iodide of Ammonium, the analogue of the Iodide of Potassium, has not yet been introduced into any English formulary, though it has for some years been employed in Germany and other countries. The Bromide of Ammonium has, however, found its way into practice here, being preferred by some physicians to the Bromide of Potassium, which it resembles in appearance, in chemical properties, and therapeutical action.

Prep.—No formula is given in the B. P. To 1 part of *Iron Filings*, suspended in 5 parts of *Water*, add gradually about 3 parts of *Bromine*. Agitate and heat gently until the whole is dissolved, forming a greenish liquid. To this add 1½ part of *Bromine*. To the solution thus obtained add *Solution of Ammonia*, until a precipitate ceases to be formed. Filter; evaporate the clear liquid to form crystals.

The Bromine and the Iron, in equivalent proportions (80 and 28), unite to form a Protobromide of Iron (Fe Br). Adding again half as much Bromine, the Perbromide (Fe_2 Br_3) is formed. This is decomposed by the Ammonia (3 equiv. = 3 N H_4O), the Ammonium uniting with the Bromine, and the 3 O with the 2 Fe to form Peroxide of Iron, which precipitates. The salt thus obtained is "in colourless crystals, which become slightly yellow by exposure to the air, and have a pungent saline taste. May be sublimed unchanged by the application of heat. Readily soluble in water; less soluble in spirit. A solution of the salt in water, mixed with mucilage of starch and a drop of an aqueous solution of bromine or chlorine, does not exhibit any blue colour." (Test for Iodides.) B. P.

Action. Uses.—An Alterative and Antispasmodic, used in much the same cases as Bromide Potassium, but somewhat milder in action. Given in scrofula, in hysteria, in uterine enlargements, in disturbance or undue excitement of the sexual functions, and to calm nervous excitability in general. Like the Salt of Potassium, it is reputed anodyne and sedative, and may cause sleep by subduing nervous irritation.

Dose.—Gr. v.–gr. xx. Introduced in B. P. 1867.

AMMONIÆ PHOSPHAS, B. Phosphate of Ammonia.

Prep.—Take of diluted *Phosphoric Acid*, f ʒxx.; *Strong Solution of Ammonia*, a sufficiency. Add the ammonia to the phosphoric acid until the solution is slightly alkaline, then evaporate the liquid, adding more ammonia from time to time, so as to keep it in slight excess, and when crystals are formed, on the cooling of the solution, dry them quickly on filtering paper placed on a porous tile, and preserve them in a stoppered bottle.

In transparent prismatic crystals, which effloresce if long exposed, losing water and ammonia. It has the composition $(P\,O_5\ 2\,N\,H_4\,O, H\,O)$, phosphoric acid being tribasic, and combined in this salt with 2 Eq. Ammonia and of basic water. Heated with K O it evolves $N\,H_3$. With Arg. Nit. it gives a light yellow precipitate. Acidulated with H Cl it gives no precipitate with H S, unless there is some metallic impurity. It is very soluble in water, and has a mild taste. *If* 20 *gr. be dissolved in water, and Sol. of Ammon. Sulph. Magnesia added, there is a crystalline precipitate* (*Ammonio-phosphate of Magnesia*), *which, when washed with Sol. Ammonia, dried, and heated to redness, leaves* 16·8 *grains* (*Phosphate Magnes.*) B. P. The salt prepared by the formula of the B. P. 1864, was the neutral phosphate $(3\,N\,H_4O)$, and yielded only 11·44 gr. to this test.

Action. Uses.—Phosphate of Ammonia has been recommended in the lithic-acid diathesis, gout, and rheumatism. It is supposed to decompose the insoluble lithate of soda in the system, forming Lithate of Ammonia and Phosph. Soda. It is said to diminish gouty concretions, and prevent gravel.

Dose.—Gr. x.–gr. xx. or more.

AMMONIÆ BENZOAS, B. Benzoate of Ammonia.

Prep.—Take of *Solution of Ammonia*, f℥iij.; *Benzoic acid*, ℥ij.; *Distilled water*, f℥iv. Dissolve the Benzoic acid in the solution of Ammonia previously mixed with the water; evaporate at a gentle heat; and set aside that crystals may form.

This salt and the phosphate were first introduced in the B. P. Benzoate of Ammonia consists of one equivalent of Benzoic acid (see *Benzoin*) and one of Ammonia, or Oxide of Ammonium. Its composition is $(N\,H_4O, C_{14}H_5O_3 + H\,O)$. It is in colourless laminar crystals, soluble in water and spirit. Heated with K O it evolves Ammonia; the addition of H Cl precipitates Benzoic acid. Persalts of iron cause a bulky yellow precipitate. If heated, it should sublime without leaving any residue.

Action. Uses.—It is a diuretic, and renders the urine acid. It undergoes a curious chemical change in the system. Out of the elements of Benzoic acid and Ammonia another organic acid, called Hippuric acid, is formed $(C_{18}H_9N\,O_6)$. It has further been supposed that the Benzoates decompose or dissolve uric acid and its compounds. They are, however, of most use in cases of inflammation, with mucous discharge from the bladder, where the urine is alkaline, and deposits earthy phosphates.

Dose.—Gr. v.–gr. xxx.

AMMONIÆ OXALAS.—Oxalate of Ammonia, in crystals, is included in the appendix of the B. P. $(N\,H_4\,O, C_2\,O_3{=}62)$. Oxalic acid (C_2O_3) is obtained by oxidising Sugar or Starch by means of Nitric. This salt is obtained by neutralising with the acid a solution of

Sesquicarbonate of Ammonia, and then evaporating, that crystals may be formed.

It is poisonous. The solution (½ oz. in 1 pint, B. P.) is used as a delicate test for Lime, and is thus employed in ascertaining the purity of water.

The solution to be tested should be first carefully neutralised with Ammonia, and a small quantity of a solution of Hydrochlor. Ammonia added. Then, on the addition of the oxalate, a white precipitate will form if any Lime is present, but solutions containing Magnesia will be unaffected.

Ammonii Sulphidum.—Sulphide of Ammonium, or Hydrosulphuret of Ammonia. ($N\,H_4\,S=34$.) A solution of Liquor Ammoniæ is saturated with a stream of Sulphuretted Hydrogen gas. The solution thus prepared has a Sp. Gr. ·999.

It has been given in Diabetes mellitus, &c. But it is chiefly employed as a test. It precipitates from a neutral solution those metallic bases which are not precipitated by $H\,S'$ from an acid solution (*vide* H S). Protosalts of Iron, Cobalt, and Nickel, are precipitated black ; of Zinc and Aluminum, white ; of Manganese, pink ; sesqui-salts of Chromium, greenish ; the earthy and alkaline bases, except Alumina, are unaffected.

METALS.

Metals may be divided into those which by union with Oxygen form—1. Alkalies, such as Potassium, Sodium, and Lithium ; 2. Alkaline Earths, Barium, Calcium, Magnesium, Aluminum ; 3. Metals commonly so called, or which form Metallic Oxides.

ALKALINE METALS.

Potassium.

F. Potassium. *G.* Kalium and Kali metall.

Potassium ($K=39$) is the metallic base of Potassa, or Potash, the Oxide of Potassium. In this state it exists in nature in abundance, combined with Acids and Earths, Iodine, Bromine, &c. ; but it is obtained chiefly from the vegetable kingdom. It was the first of the metallic bases obtained by Sir H. Davy ; being produced by galvanising Caustic Potash very slightly moistened, when the metal in small globules appeared at the negative pole. It is now commonly obtained by exposing Potash to intense heat with Iron filings or Charcoal, which take its Oxygen, by which the Potassium is set free.

Prop.—Potassium at 55° F. is a soft malleable solid. It has been crystallised in cubes, is brittle at 32°, and fuses at 156°; at 60° F. its Sp. Gr.=0·86 ; it is therefore light enough to float on water. It is silvery-white, but immediately tarnishes when exposed to air, from its great affinity for Oxygen, which it will take also from water, swimming and burning upon it with great brilliancy, and being converted into Potash, while the Hydrogen escapes. It is preserved in fluids, such as Petroleum and Naphtha, which contain no Oxygen, as it is one of the most powerful deoxidising agents known.

POTASSA. Potassa Caustica, B. Oxide of Potassium. Potash. *Potassa fusa. Potassæ Hydras. Kali purum. Fixed Vegetable Alkali. F.* Potasse caustique. *G.* Kali.

Potassa (KO = 47) is a compound of Oxygen and the metal Potassium. The name Potassa was derived from the commercial name Potash, which is applied to a Carbonate of Potassa. Dr Black in 1756 first clearly distinguished the Carbonate from the caustic alkali. This he called Lixivia, from the name in Pliny ; but it was afterwards named *Kali.* The ancients were, no doubt, acquainted with some method of depriving the alkali of its Carbonic acid, as they were skilled in the art of making soap. (Pliny, xxviii. c. 51.)

From the affinity of Potassium for Oxygen, the Oxide or Potash is readily formed by exposing the metal to dry air or to Oxygen gas. Some of it may also be found in the gun-barrel which is commonly used in the process of making Potassium. But it has so great an attraction for water, that it readily absorbs it from the air, and is therefore usually seen in this, which is the officinal state, as Potassæ Hydras, K O, H O = 56.

Prop.—Caustic Potash, when fused and pure, is whitish, in solid, slightly crystalline masses, sometimes in tetrahedral pyramids or octohedrons ; hard and brittle ; Sp. Gr. 1·70 ; usually cast in cylindrical pieces or sticks, of a grayish colour, of an intensely caustic taste, with little smell. When moistened it has a soapy feel, due to its power of dissolving the cuticle. It readily attracts moisture, and at the same time Carb′ from the atmosphere. It is soluble in water, producing heat when in a fused state, but some cold when crystallised ; also in alcohol, with the exception of impurities. Hence it may be separated from its Carbonates, as these are insoluble in Alcohol. It liquefies ice, with the production of intense cold ; is not decomposed by the most intense heat, but fuses below a red heat, and at a bright red heat evaporates in white acrid fumes. It turns green the blue colour of vegetables, but afterwards destroys them, as well as other organic substances, by abstracting from them the elements of water. Thus its caustic power depends on its affinity for water. It possesses highly alkaline properties, uniting with fixed Oils and Fats to form soaps, and with acids to form salts. It combines with considerable energy with Phosphorus and with Sulphur ; when fused with Siliceous Earth, it forms Glass ; and when in larger proportion, a Silicate of Potash soluble in water. With other earths it forms enamels, and even when in solution dissolves Alumina and Glucina. Its salts are soluble in water, and generally crystallisable ; when added to a solution of Sulphate of Alumina, they cause the formation of Alum in crystals. Tartaric′, if added in excess, produces a precipitation of Cream of Tartar, or

Bitartrate of Potash; while Chloride of Platinum throws down a reddish-yellow precipitate of Chloride of Platinum and Potassium; the salts of Potash, moreover, give a violet tinge to flame, and may by these characters be distinguished from the salts of Soda.

The common method of obtaining it is to decompose one of the most commonly obtained of the salts of Potassa, that is, the Carbonate, by means of Lime, and then to evaporate the solution to dryness.

Prep.—B. Boil down *Solution of Potash*, Oij. rapidly in a silver or clean iron vessel till all ebullition ceases, and a fluid of oily consistence remains, a drop of which, when removed on a warm glass rod, solidifies on cooling. Pour this into proper moulds, and, when it has solidified, and while it is still warm, put it into stoppered bottles.

The solution of Potash employed should be itself pure, and so preserved as not to have attracted Carb′ from the air; while the ebullition and temperature are kept up no Carb′ is absorbed. A clean iron vessel is sufficient, but the contact of all organic substances must be prevented.

[Wöhler finds that Caust. Pot. of great purity may be made by heating the Nitrate to redness in a crucible along with 2–3 parts of Copper filings. The Potash is separated from the Copper by lixiviating in water.]

Tests.—B. P. "In hard white pencils, very deliquescent, powerfully alkaline, and corrosive. A watery solution acidulated with Nitric Acid gives a yellow precipitate with Perchlor. Platinum." This is the positive test for Potash. The same gives "scanty white precipitates with Nitrate of Silver and Chloride of Barium." This allows of the presence of minute quantities of Chlorides and Sulphates. The E. P. stated that Oxide of Iron was commonly present, and left undissolved by boiling water. It was not to exceed 1·25 per cent., and was derived from the moulds in which the fused Potash was cast.

56 *gr. dissolved in water leave only a trace of sediment, and require for neutralisation at least* 900 *measures of the volumetric Sol. Oxalic acid.* (B. P.)

Action. Uses.—Escharotic, Caustic Poison, Antacid. (See *Liquor Potassæ.*)

[Potassa cum Calce, L.

Hydrate of Potash being chiefly employed as a caustic, and being objectionable on account of its deliquescence, this preparation is often preferred, as the presence of Lime obviates the inconvenience.

Prep.—L. Take *Hydrate of Potash*, ℥j.; *Lime*, ℥j.; rub together, and keep in a well-closed vessel.

When mixed with water it is slaked, and when an acid is added, no bubbles of CO_2 should be evolved. L.

Action. Uses.—Caustic; made into a paste with Rectified Spirit, and applied, the neighbouring parts being defended with sticking-plaster.]

Liquor Potassæ, B. Solution of Potash.

Prep.—B. Dissolve *Carbonate of Potash*, ℔j. in *Dist. water*, Cj.; and, having heated the solution to the boiling point in a clean iron vessel, gradually mix with it *slaked Lime*, ℥xij.; and continue the ebullition for ten minutes with constant stirring. Then remove the vessel from the fire; and when by the subsidence of the insoluble matter the supernatant liquor has become perfectly clear, transfer it by means of a syphon to a green-glass bottle furnished with an air-tight stopper. (Add *Dist. water*, if necessary, to correct Sp. Gr.)

The Lime, having a strong affinity for Carb′, unites with that of the Carb. Pot.; the insoluble Carb. of Lime being precipitated, the free Potash remains in solution. Filters are not employed, because the Potash destroys all organic matter, and the process is tedious. The solution should be as little as possible exposed to the air, as it absorbs Carb′. The purity will depend upon the Carbonate of Potash and Lime, as well as upon that of the water employed. Dr Christison states that the decomposition of the Carb. is accelerated by the ebullition.

Prop.—Solution of Potash is colourless, transparent, somewhat oily-looking, without odour, but of an extremely acrid, caustic taste. The quantity of real Potash in solutions of different Sp. Gr. was ascertained by Dalton. This solution has a Sp. Gr. of 1·058. That of the late solution of the L. P. was 1·063. (According to Dalton's table, a solution having the density 1·06, contains 4·7 per cent. of Potash.) It feels soapy when rubbed between the fingers, is highly alkaline, rapidly absorbs Carb′ from the air, must moreover be kept in well-stoppered green-glass bottles, because it acts on those made of flint glass. It forms soaps with oils and fats, and powerfully decomposes many salts, as those of Ammonia, and of the Earths and Metals, throwing down their oxides from a solution, some of which oxides it redissolves when added in excess. It corrodes both animal and vegetable textures, and precipitates from vegetable infusions any alkalies or neutral principles, itself combining with their acids.

Tests.—Sp. Gr. 1·058 (B. P.), browns Turmeric, and, like other salts of Potash, throws down a yellow precipitate with Chloride of Platinum, which is insoluble in Spirit. It should not effervesce with N′, or become milky on the addition of Lime water, which would show the presence of Carb′. When saturated with N′ scarcely anything should be precipitated by Oxalate of Ammonia (showing that no Lime is present), while with Chlor. Barium (Sulphates), with Nitr. Silver (Chlorides), and with Ammonia (Iron), there are but slight precipitates.

One fluid ounce (462·9 *gr. by weight*) *requires for neutralisation* 482 *measures of the volumetric Sol. Oxalic acid.* 1 oz. contains 27 gr., or 5·84 per cent. of Hydrate of Potash.

According to the editors of Pereira, *lead* is frequently present as an impurity in solution of potash, owing to its having been kept in flint glass bottles, or badly glazed earthern vessels. It then is turned brown by a drop of solution of Hydrosulph. Ammonia.

Inc.—Acids, Acidulous and Ammoniacal Salts, Earthy and Metallic Salts, Subchloride and Perchloride of Mercury.

Antidotes.—Oil, Acids, Vinegar, Lemon juice.

Action and Uses of Potash and its Salts.—Potash is a powerful corrosive, and is extensively used externally as a Caustic. The

Potassa fusa may be employed as a local cautery, or in the formation of issues, &c.; but on account of its deliquescence, its action tends to spread, and it needs to be circumscribed or confined in some manner. The solution of Potash, still further diluted with water, is given internally in disorders requiring an alkali—that is, in cases where there is an excess of acid in any part of the system; in Acid Dyspepsia, or Gastrodynia; in Lithic deposit, or Calculus, attended with undue Acidity of the urine; in Gouty and Rheumatic disorders generally. Potash is also Antiphlogistic in inflammations, possibly from its power in dissolving the fibrine of the blood, and thus hindering the deposit of lymph. In a similar manner it may arrest the progress of Tuberculous disorders. It has been given with advantage in Scrofula and Syphilis.

Potash is absorbed in the stomach, passes through the system, and will produce an alkaline state of the urine, if its use be persevered in. It impoverishes the blood while passing through it. The Carbonates of Potash resemble the free Alkali in their action, but are milder in direct proportion to the amount of Carb. acid which they contain. Both Potash and its Carbonates act as Diuretics.

The Nitrate, Chlorate, Sulphate, &c., exert the Antiphlogistic operation, or power of controlling inflammation, which is common to all salines. Nitre may be taken as a type of saline remedies. It has been used by some in Scurvy and in Rheumatism. The Sulphates, Tartrates, Citrate, and Acetate, are Cathartic in large, Diuretic in small doses. The Acetate, Citrate, and neutral Tartrate, being oxidised in the system, and thus transformed into Carbonates, act on the urine as alkalies. The Bitartrate (or Acid Tartrate) is not found to undergo this change.

Dose.—♏x.-f ʒj. gradually increased, with Infusion of Orange Peel, &c.

Potassii Iodidum, B.

Iodide of Potassium. *Ioduret of Potassium.* *Hydriodate of Potash.*
F. Iodure de Potassium. *G.* Iod Kalium.

Iodide of Potassium (K I=166) was first discovered by Courtois in 1812. It exists in Sea as well as in some Mineral waters, in Sea-weeds and Sponges, and was first employed in medicine by Coindet.

Prop.—It is a colourless salt, of an acrid saline taste; often opaque, but, when carefully prepared, transparent, and crystallised in cubes or in quadrangular prisms. The sides of the cubes are often regularly excavated, the angles remaining distinct. These contain no water of crystallisation, but some is often lodged between the plates of the crystals; hence they decrepitate when heated. It fuses at a low red heat, and volatilises unchanged. It is permanent in dry air; soluble in ⅔ of its own weight in water. The following description is given in the B. P.:—"In colourless, generally opaque, cubic crystals, readily soluble in water, and in a less degree in spirit." (Six or eight parts.) It commonly has a feeble alkaline reaction; its solution mixed with mucilage of starch gives a blue colour on the addition of a minute quantity of solution of chlorine. It gives a crystalline precipitate (Bitart. Potash), with Tartaric acid. The addition of Tartaric acid and mucilage of starch to its watery solution does not develop a blue colour. (The object of this test will be presently shown.) Solution of nitrate of silver added in excess forms a yellowish-white precipitate, which, when agitated with ammonia, yields by subsidence a clear liquid in which excess of nitric acid causes no turbidity. Its aqueous solution is only faintly precipitated by the addition of lime.

That the Salt is an Iodide is proved by the reaction with Starch, Cl being at the same time added. (Nitric acid also sets free Iodine, by means of some lower oxide of Nitrogen, which it almost invariably contains, *see* p. 43.) That it is a Potash solution is shown by the precipitation with Tartaric acid.

There are five chief negative tests, denoting the absence of special impurities, to be presently considered. They are Turmeric, Lime water, Chloride Barium, the Tartaric acid and Starch test, and the Silver and Ammonia test. K I renders Iodine more soluble both in Water and in Alcohol. When dissolved, solution of Acetate of Lead produces a yellow precipitate (Iodide of Lead), and Protonitrate of Mercury, a greenish Iodide of Mercury; the Pernitrate, or Perchloride of Mercury, causes a greyish-red, which soon becomes brilliant red (Periodide of Mercury), which is re-dissolved either by an excess of Iodide of Potassium or of Corrosive Sublimate.

Prep.—The B. P. gives a formula for the preparation of Iod. Potassium, which is the same as that long adopted by manufacturers. Iodine is dissolved in a solution of Caustic Potash. The solution is evaporated to dryness, and the residue heated to redness with some charcoal. The salt is then dissolved out and crystallised. The exact proportions required are those of the equivalents, of 127 I. to 47 of pure Potash (Liq. Potassæ 1 gallon, Iodine 29 oz. B. P.) 6 Eq. of each react mutually in this way. 5 of the Iodine combine with 5 of Potassium, setting free 5 of Oxygen. These 5 Eq. of Oxygen unite with the remaining Eq. of Iodine, forming Iodic acid (IO_5), which combines with the other Eq. of Potash to make the Iodate of Potash—

$$6\,I + 6\,KO = 5\,KI + KO, IO_5.$$

When heated to redness with charcoal, the 6 Eq. of Oxygen in the Iodate pass off as Carbonic acid, making 1 more Eq. of K I. Any Iodate left forms an impurity.

In the L. P. of 1836 this salt was made by decomposing Iodide of Iron with Carbonate of Potash.

The chief adulterations and impurities are six—Water, free Potash, Carb. Potash, Sulphates, Iodate of Potash, Chlorides of Potassium and Sodium.

(1.) *Water* may be present originally, or due to the deliquescence of the Salt. Iodide of Potassium should lose no weight when heated.

(2.) Free Alkali may be present when it is not carefully prepared. It will then brown Turmeric paper, but may not precipitate Lime water. The B. P. allows a slight alkalinity.

(3.) *Carbonate of Potash* is a common impurity. The salt is then irregularly crystallised, very deliquescent, not entirely dissolved by Alcohol, in which Carb. Potash is insoluble. The solution also gives with Lime water, and Sol. Chlor. Barium, a white Precip., soluble in Nitric acid. It further destroys the colour of Tinct. Iodine.

(4.) *Sulphates* (of Potash, Soda, or Lime) may be detected by the solution of Chlor. Barium, forming with it a white precipitate, insoluble in Nitric acid.

There should only be a trace of $S O_3$, but alkaline sulphates are sometimes used as adulterations, in which case there will be a copious precipitate.

(5.) The presence of *Iodate of Potash* depends upon the employment of an insufficient heat in the process, part of the Iodate remaining undecomposed. Now the addition of Chlorine water to K I in solution sets free Iodine, which may be known by the blue colour with Starch. But if the salt be pure, and pure Sulphuric′, or even pure Nitric′, be added to it, Hydriodic acid is disengaged, which does not affect Starch until some time has elapsed. Yet Sulphuric acid generally, and Nitric acid always, contain a minute quantity of Nitrous′ ($N O_4$), the action of which on the salt is similar to that of Chlorine. (See *Tests* for Iodine.)

For this reason Tartaric acid is employed, which is sure to set free Hydriodic′ only, and when added to pure K I and Starch causes no blue colour. But when any Iodate is present, this blue colour is produced, for this reason. Hydriodic and Iodic acids are disengaged together. They immediately react on each other, producing free Iodine, and water from the H and O. Thus,

$$5\,H I + I O_5 = 6\,I + 5\,H O.$$

The test is very delicate, the blue colour being developed instantly when the Iodate is present.

(6.) *Chlorides* (of Potassium or Sodium) are not uncommonly present. The solution gives a precipitate with Nit. Silver. The Chloride of Silver is soluble in Ammonia, the Iodide is not. So that if Chlorine be present, when this precip. is digested in Liq. Amm. Fort., and Nitric′ sufficient to neutralise the Ammonia added to the filtered solution, the Chloride Silver (having been dissolved out of the first precip.) will go down again. In the case of pure K I, there is no precipitate from the Ammoniacal liquor.

Bromide of Potassium, Xanthate of Potash, and Cyanides, are more rarely present as impurities. (*p.*)

Inc.—Acids, Acidulous and Metallic Salts.

Action. Uses.—Irritant, Stimulant of the Absorbents, Diuretic; in Venereal nodes, and eruptions, or sore throat, and Rheumatism. It resembles Iodine in its action. (q. v.)

Antidotes.—Evacuate the stomach; give Demulcents; obviate Inflammation, and allay Irritation.

Dose.—Gr. iij.-gr. x.; ʒj. even ʒij. have been given.

UNGUENTUM POTASSII IODIDI, B. Ointment of Iodide of Potassium.

Prep.—B. Dissolve *Iodide of Potassium*, gr. lxiv., and *Carbonate of Potash*, gr. iv., in *Dist. water*, fʒj., and mix with *Prepared Lard*, ℥j.

This being a simple ointment, and devoid of colour, is preferable for some frictions, as it does not stain the skin. It contains a small quantity of soap, formed by the Potash. It may be employed stronger than in the above preparation.

LINIMENTUM POTASSII IODIDI CUM SAPONE, B. Liniment of Iodide of Potassium and Soap.

Prep.—Take of *Hard Soap*, cut small, *Iodide of Potassium*, of each, ℥jß.; *Glycerine*, f℥j.; *Oil of Lemon*, fʒj.; *Distilled water*, f℥x. Dissolve the soap in f℥vij. of the water by the heat of a water-bath. Dissolve the Iodide of potassium and glycerine in the remainder of the water, and mix the two solutions together. When the mixture is cold add the oil of lemon, and mix the whole thoroughly.

Introduced in B. P. 1867. A colourless application, employed, as the last, to reduce glandular swellings and local inflammations.

LIQUOR IODI, B. Solution of Ioduretted Iodide of Potassium. (*Vide* IODINE.)

TINCTURA IODI, B. (Compound) Tincture of Iodine. Tincture of Ioduretted Iodide of Potassium. (*Vide* IODINE.)

The presence of Iodide of Potassium increases the solubility of Iodine, and retains it in solution; so that it may be added to water without decomposition, or it may be given in Sherry wine. It is supposed to form with it a Biniodide ($K I_2$).

UNGUENTUM IODI, B. LINIMENTUM IODI, B. Ointment and Liniment of *Ioduretted* Iodide of Potassium. (*Vide* IODINE.)

[**EMPLASTRUM POTASSII IODIDI, L.** Plaster of Iodide of Potassium.

Prep.—L. To prepared *Frankincense*, ℥vj., melted with *Wax*, ʒvj., add *Iodide Potassium*, ʒj., first triturated with *Olive Oil*, fʒij., and stir constantly until they cool.

This plaster is to be spread on linen rather than on tanned leather.

Use.—A good application to chronic glandular swellings, or scrofulous tumours. Omitted in the B. P.]

POTASSII BROMIDUM, B. Bromide of Potassium. *Hydrobromate of Potash.* *F.* Bromure de Potassium. *G.* Brom Kalium.

Bromide of Potassium ($K\,Br = 119_3$), discovered by Balard in 1826; introduced into the L. P. of 1836, but omitted in 1851.

Prop.—It is white, without odour, of a sharp saline taste; crystallised in transparent cubes, or four-sided flattish prisms, without any water of crystallisation. Readily dissolves in Aq., less so in Alcohol. When heated, the crystals decrepitate, and may be fused without decomposition. Readily decomposed by Chlorine, which expels the Bromine ; so also by the mineral acids, acidulous salts, and the metallic salts. This salt consists of 66·1 parts of Bromine with 33·9 of Potassium in 100 parts. (*See* Tests for *Potassium* and *Bromine.*)

Prep.—B. Similar to that of *Iodide of Potassium*, the reactions being identical. ʒiv. of *Bromine* are used for Oij. of *Solution of Potash.*

Tests.—The crystals should be colourless, totally soluble in water, and not affect Litmus or Turmeric, as it is neither acid nor alkaline. Chlorine water and Starch added together render it yellow (as characteristic of Bromine). If the fluid be then shaken with ether it dissolves out the Bromine, and rises with it to the top, exhibiting a red colour. This is Balard's test. Subjected to heat, the crystals lose no weight (because no water is expelled). Chlor. Bar. throws down nothing from the solution, showing the absence of Sulphates. Gr. 10 of this salt are capable of acting upon gr. 14·28 of Nitr. Silver, and precipitating a yellowish Bromide Silver, which is dissolved by Ammonia, and but very little by Nit′. The B. P. gives the following test for Iodides, as Iod. Potassium is a common impurity in this salt:—" A solution mixed with mucilage of starch and a drop of an aqueous solution of Bromine or Chlorine, does not exhibit any blue colour." The Bromine or Chlorine would displace any Iodine, and, setting it free, enable it to act on the starch. *Ten grains require for complete decomposition* 840 *measures of the volumetric sol. Nit. Silver.* (B.)

Inc.—Acids, Acidulous Salts, Metallic Salts.

Action. Uses.—Alterative, Deobstruent. Resembles the Iodide. It has a special power of subduing irritation of the nervous system, and is thought to act as a sedative in cases of sexual excitement or hysteria. It is also much used in epilepsy. In large doses it acts indirectly as a narcotic.

Dose.—Gr. v.–gr. xxx. three times a-day.

CARBONATE OF POTASH.

Subcarbonate of Potash. Salt of Tartar. Salt of Wormwood, Kali præparatum. F. Carbonate de Potasse. *G.* Kohlensaures Kali.

As this salt is obtained by the burning of vegetables, it must have been known at very early times. Dioscorides describes it by the name τεφρα κληματινης, or *cinis sarmentorum*, ashes of vine-twigs. (" Cineris lixivium." Pliny, xxxviii. c. 51.) The Arabs are usually supposed to have been the first to make known this alkali (al-*kali*) ; but the Hindoos, in works from which the Arabs copied, made use of the ashes of plants. Potash is found in most of the alkaline-earthy minerals, as Mica, Felspar, Leucite, Nacrite. Carbonate of Potash has been found in a few mineral springs. It is probably found in the juices of some plants. But usually Potash is combined with other acids, then forming Acetates, Malates, Oxalates, Tartrates, &c.

By incineration, the vegetable acid is burnt, and at the same time acquiring more Oxygen and losing Hydrogen, because Carbonic′, which, combining with the Potash, forms a Carbonate of Potash. This, in its most impure state, is the Potash, or Rough Potash, of commerce. To obtain this, land plants are burnt in countries where forests are most abundant, as N. America, Russia, Sweden, Poland. The wood is piled in heaps and burnt on the surface of the ground, in a place sheltered from the wind. "The ashes which are left consist of a soluble and insoluble portion. The *soluble* part is made up of the Carb. together with the Sulphate, Phosphate, and Silicate of Potash, and the Chlorides of Potassium and of Sodium; and the insoluble portion, of Carbonate and Subphosphate of Lime, Alumina, Silica, the Oxides of Iron and Manganese, and a little carbonaceous matter that has escaped incineration." (Wood and Bache.)

POTASSÆ CARBONAS (IMPURA). Impure Carbonate of Potash. *Potashes. Pearlashes.*

This is prepared on the large scale by subjecting to the action of flame crude or Black Potash, the *black salt* of American manufacturers. Instead of fusing it to make the *Potashes* of commerce, the alkaline mass is transferred to a large oven-shaped or reverberatory furnace, where the flame is made to play over it; and being well stirred about, the black impurities (carbon) are burnt out, and the mass becomes a caustic salt of a white colour (W. and B.) with a tinge of blue, constituting the *Pearlash* of commerce.

American Potash and American Pearlash, as ascertained by Vauquelin, contained in 1152 parts,

	(1)	(2)
Caustic Hydrate	857	754
Sulph. Potash	154	80
Chlor. Potassium	20	4
Carbonic′ and Aq.	119	308
Insoluble matter	2	6
	1152	1152

Russian Potash yields 772 parts of Caustic Hydrate; it used to be very impure, but is now more carefully prepared. For commercial purposes it is extremely necessary to have modes of ascertaining the quantity of alkali contained in any specimen of Commercial Potash. This is done by the process of Alkalimetry.

Uses.—Chiefly pharmaceutical.

POTASSÆ CARBONAS, B. Potassæ Carbonas Pura.

Carbonate of Potash ($KO, CO_2 = 69$) is in white roundish grains; sometimes it may be crystallised from a strong solution, by slow cooling, in opaque rhombic octohedrons. The taste acrid, alkaline, and nauseous; odour none; so deliquescent as to form a liquid, which used to be called *Oleum Tartari per deliquium;* soluble in its own weight of water, insoluble in Alcohol; alkaline in its reaction on Turmeric and the infusion of Cabbage, effervescing with acids, and forming a solution with which Perchlor. Platinum gives a yellow precipitate. The common salt is a sesquihydrate, containing 2 Eq. of Pot. Carb. to 3 of water.

Prep.—There are several ways in which this salt may be prepared, of a greater or less degree of purity. The L P. of 1836 ordered it to be made by lixiviating and granulating crude Pearlashes, thereby getting rid only of the insoluble impurities. The E. P. ordered Bicarb. Potash to be heated in a crucible to a red heat. 1 equiv. of Carb′ is driven off, and the product is very pure. The D. C. heated Bitartrate of Potash in an iron pot till vapours cease to be evolved. A product called *black flux* is obtained, consisting of Carb. Potash, Charcoal, and some Caustic Potash. This is lixiviated, and during filtration washed with a solution of Sesquicarb. Ammonia, to neutralise any free K O. The solution is evaporated, and again heated to low redness, to drive off Ammonia.

[The Prussian Codex orders pure Carbonate Potash to be made by deflagrating the Bitartrate with half its weight of Nitrate.]

Tests.—At a red heat it loses 16 per cent. of its weight. "It is precipitated only faintly by Chlor. Barium and Nit. Silver." 83 *gr. require for neutralisation at least* 980 *measures of the volumetric sol. Oxalic acid.* The E. P. rightly distinguished between the purified (lixiviated) Pearlash and the *Pure* Carbonate. The latter should contain no sulphates or chlorides, as ascertained by the usual tests. Silica may be detected by a cloudiness or fleecy precipitate forming on N′ or H Cl′, being added to neutralisation; on then evaporating and igniting the residue, any Silica will be insoluble in water. (The B. P. allows a little.) The C′ is readily recognised by effervescing with any of the acids, and by forming a milky solution with Lime water. The Carbonate which is formed will effervesce and dissolve in Acetic acid. A white precipitate (Carbonate of Magnesia) is also formed when this salt is added to a solution of Sulphate of Magnesia; as this does not take place when Bicarbonate of Potash is added, this Sulphate is a useful test for distinguishing the one from the other. With Chloride of Mercury a brick-red precipitate of Oxide of Mercury is formed.

Inc.—Acids and Acidulous Salts, Hydrochlorate and Acetate of Ammonia, Lime water, Chloride of Calcium, Sulphate of Magnesia, Alum, and several other alkaline, earthy, and metallic salts.

Action. Uses.—Corrosive, Antacid, and Poisonous, like Liq. Potassæ, but milder. Diuretic, Alterative, Antilithic. Often employed for making effervescing Draughts. Carb. Potassæ, gr. xx = Cit′ or Tar′ gr. xviij. or fʒiv. of Lemon-juice.

Dose.—Gr. x.–ʒß.

Antidotes.—Vinegar, Oil, Lemon-juice.

POTASSÆ BICARBONAS, B.

Bicarbonate of Potash. *Aërated Kali.* *G.* Doppelt Kohlensaures Kali. *F.* Bicarbonate de Potasse.

This salt ($KO, 2\,CO_2 + Aq = 100$) was first prepared by Cartheuser in 1752, and examined by Bergmann, who devised various modes of preparing it. The older chemists obtained it by simply exposing Carbonate of Potash for some months to the air, or to an atmosphere charged with Carb′ until sufficient gas was absorbed. It may also be prepared, as in the B. P., by passing a stream of Carb′ gas through a solution of Carbonate of Potash to saturation.

Prop.—Bicarbonate of Potash is a colourless and transparent crystalline salt; its crystal is a modification of a right rhombic prism. Its taste is much milder than that of the Carbonate, and it has so little alkalinity as to colour Turmeric paper only slightly. It is soluble in about 4 parts of water at 60°, and in five-sixths of hot water; boiling water speedily decomposes it, from the expulsion of Carb′, and it becomes a Sesquicarbonate. It is insoluble in Alcohol. Exposed to a red heat it loses 1 equivalent of Carb′, likewise any water which may be deposited within its crystals, and is converted into the Carbonate of Potash. Hence this method is adopted to procure the pure Carbonate. The Carb′ in this salt is readily detected by its abundant effervescence with acids, likewise by the insoluble precipitate formed by it in Lime or Baryta water. But a moderately diluted solution of Bicarbonate of Potash yields no precipitate with Sulphate of Magnesia or with Perchloride of Mercury; hence the former is often prescribed with it in effervescence. "The Perchloride of Mercury causes a slight white precipitate or opalescence with it." (*p.*) It is composed of per cent. K O 47·53 + C′ 43·56 + Aq. 8·91 = 100.

The B. P. obtains it by passing Carbonic′ (obtained by acting on marble with dilute H Cl) to saturation through a solution of the Carbonate. The solution is placed in a cool place that cryst. may form; these are then dried by exposure to the air, and kept in a well-stopped bottle. The mother liquor, if concentrated at a temperature not exceeding 110°, yields more crystals.

The Carb. Pot. takes an additional Eq. of Carb′, being converted into the Bicarbonate, but pressure is required for the proper absorption of the gas.

Tests.—The usual impurities in this salt are Carbonate and Sulphate of Potash. Totally dissolved by water, the solution slightly changes the colour of Turmeric, but highly if the Carbonate be present. Sulphate of Magnesia throws down nothing from this solution, unless it be heated. (A large portion of the Carbonate, Dr C. says even 50 per cent., may be present without Sulphate of Magnesia detecting it, when mixed with the Bicarbonate). A solution in 40 parts of water will give a brick-red precipitate with solution of corrosive sublimate if the salt contains even so little as a hundredth part of Carbonate. (*c.*) After the addition of excess of Nitric′, Chloride of Barium or Nitrate of Baryta throws down nothing (unless Sulphates be present), and Nitrate of Silver very little if anything (if Chlorides be absent). By a red heat 100 parts lose 30·7 of Carb′ and of water. If the crystals be moist, the loss of water will be greater; and if Carb′ be deficient, the loss will be less. 50 *gr. exposed to a low red heat leave* 34½ *gr. of white residue, which* *require for saturation* 500 *measures of the volumetric solution of Oxalic acid.* (B.)

Inc.—Nearly the same as with Carbonate of Potash. Acids, acidulous salts, Acetate and Hydrochlorate of Ammonia, Lime water, Chloride of Calcium, alkaline, earthy, and metallic salts.

Action. Uses.—Antacid, antilithic, diuretic, resolvent, milder and less corrosive than the Carbonate. The best remedy that we possess in Rheumatism, in acute cases of which it should be given in large doses until the urine is rendered neutral.

Dose.—Gr. x.–ʒß or ʒj. For effervescing draughts, 20 gr. Bicarb. Potash = 14 gr. of Cryst. Cit.′ or fʒiijß of Lemon juice.

LIQUOR POTASSÆ EFFERVESCENS, B. Effervescing Solution of Potash. Aqua Potassæ Effervescens, E. P. Potash Water.

Prep.—B. Take of *Bicarbonate of Potash*, gr. xxx.; *Water*, Oj. Dissolve the Bicarbonate of Potash in the water, and filter the solution; then pass into it as much pure washed Carbonic acid gas, obtained by the action of Sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.

A solution of the bicarbonates with excess of Carbonic acid. It resembles the Potash water commonly sold. It was contained in the E. P., and has been re-introduced in the B. P. 1867. It effervesces strongly when the containing vessel is opened, Carbonic acid gas escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste. *Ten fluid ounces, after being boiled for five minutes, require for neutralisation* 150 *grain measures of the volumetric sol. Oxalic acid.* Five fluid ounces evaporated to one-fifth, and 12 grains of Tartaric acid added, yield a crystalline precipitate, which, when dried, weighs not less than 12 grains. (B. P.)

Action. Uses.—An agreeable form in which to administer Potash. It counteracts nausea, and reduces heat in fevers and inflammations. It may be used as a vehicle for medicines with which the Bicarb. Potash is not incompatible.

Dose.—℥v.–Oj.

LEMON and KALI.—A mixture of powdered *white sugar*, dried and powdered *citric acid*, and powdered *bicarbonate of potash*, employed for making extemporaneous effervescing draughts.

Effervescing powders may be made with *Tartaric acid*, ℥j.; *Bicarb. Potash* ℥j. and gr. 160. Reduce both to fine powder, and divide into 16 parts. Preserve the acid and alkaline powders in separate papers of different colours. *Pulveres Effervescentes Citrati* contain Citric instead of Tartaric acid. Bicarb. Soda may be substituted for Bicarb. Pot. employing rather less.

POTASSA SULPHURATA, B. Sulphurated Potash.

Sulphuret (or Sulphide) of Potassium. *Hepar Sulphuris. Kali Sulphuratum. F.* Sulfure de Potasse. Sulfure de Potassium Sulfaté. *G.* Schwefel Kalium.

The Sulphuret of Potassium was formerly known by the name of

Liver of Sulphur. The solubility of Sulphur in an alkaline solution was known to Geber; but Albertus Magnus taught the method of procuring Sulphuret of Potassium by fusion. (*p.*)

Prop.—When carefully prepared, it forms a hard brittle solid, of a liver-brown colour; without smell when dry, but emitting a smell of Hydrosulphuric′ when moistened; taste, acrid and nauseous; its solution in water is of an orange colour, with a strong odour. When exposed to the air, it becomes moist and greenish-coloured, and then white and without odour, from the action of Oxygen, by which ultimately a Sulphate of Potash is formed, while a portion of the Sulphur is deposited. It is readily decomposed by acids, as by $H\,Cl'$, as they evolve Hydrosulphuric acid, combine with the Potash, and precipitate the Sulphur; as also by most of the metallic salts, of which the metals are deposited in the form of Sulphurets. According to Berzelius, this compound consists of 3 Eq. of *Tersulphuret* of Potassium to 1 of *Sulphate* of Potash. $(3\,K\,S_3 + K\,O,\ S\,O_3.)$ According to the analysis of Winckler, it contains the tersulphuret, with hyposulphite, sulphite, and sulphate of potash. But Mr Phillips assumes, from the researches of Fordos and Gelis, that it contains 2 Eq. of the *Pentasulphuret* with 1 of *Hyposulphite.* $(2\,K\,S_5 + K\,O,\ S_2\,O_2.)$

Prep.—B. Mix *Carbonate of Potash* in powder ℥x., and *Sublimed Sulphur* ℥v. in a warm mortar, and, having introduced them into a Cornish or Hessian crucible, let this be heated, first gradually until effervescence has ceased, and finally to dull redness, so as to produce perfect fusion. Let the liquid contents of the crucible be then poured out on a clean flagstone, and covered quickly with an inverted porcelain basin so as to exclude the air as completely as possible while solidification is taking place. The solid product thus obtained should, when cold, be broken into fragments, and immediately enclosed in a green-glass bottle, furnished with an air-tight stopper.

In the formula of the E. P. the proportion of sulphur to Carb. Potash was 1 to 4. As there was an excess of the latter, some of the Carbonate remained undecomposed. Twice as much sulphur is now ordered. Mr Fownes states that equal parts of sulphur and the carbonate must be used to obtain the Pentasulphuret (see below), and that if the proportions are 1 to 2 the Tersulphuret is formed.

When Carb. Pot. is melted with Sulphur, Carb′ is expelled. The Oxygen of ⅔ds of the Potash combines with 2 parts of Sulphur to form Hyposulphurous acid, which, uniting with the undecomposed Potash, forms 1 Eq. of Hyposulphite of Potash (Phillips). Sulphuret of Potassium is, at the same time, formed by the union of the Potassium with a portion of the Sulphur—

$$3\,(K\,O,\ C\,O_2) + 12\,S = K\,O,\ S_2O_2 + 2\,K\,S_5 + 3\,C\,O_2.$$

This preparation would thus be a mixture of Pentasulphuret of Potassium with Hyposulphite of Potash. When it is exposed to the air, or kept long, Sulphate of Potash is formed by oxidation.

Tests.—In greenish fragments, which, fresh broken, exhibit a brownish-yellow colour. Dissolved in water, or in almost any acid, it exhales a smell of Hydrosulphuric acid. The aqueous solution is of a yellow colour. Three-fourths of its weight are dissolved by rectified spirit. (B.) What is thrown down by Acetate of Lead is first red, but it afterwards becomes black. Dr Pereira has ascertained that the alkaline monosulphurets give a black, and the polysulphurets a red precipitate with solutions of Lead. If the Sulphuret should have been long kept, and have become changed, these characteristics will not be seen.

Inc.—Acids and metallic salts.

Action. Uses.—Irritant, Stimulant, Diaphoretic. Alterative in Skin diseases. *Ext.* Detergent.

Dose.—Grs. iij.–gr. x. or gr. xv. with honey or with soap made into pills. *Ext.* as an ointment with lard, or in a watery solution of soap, or in baths, 1 part to 1000 of water.

UNGUENTUM POTASSÆ SULPHURATÆ, B. Ointment of Sulphurated Potash.

Prep.—Take of *Sulphurated Potash*, gr. xxx.; *Prepared Lard*, ℥j. Triturate the sulphurated potash in a porcelain mortar, and gradually add the lard, rubbing them together until the ointment is perfectly smooth and free from grittiness.

This ointment, when used, should be recently prepared. Used in Scabies, and other chronic skin diseases.

POTASSÆ SULPHAS, B.

Sulphate of Potash. *Kali Vitriolatum. Sal Polychrestum. F.* Sulfate de Potasse. *G.* Schwefelsäures Kali.

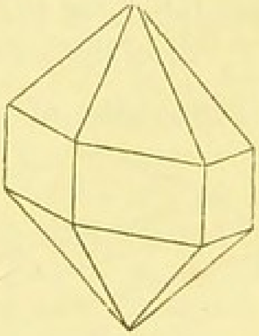

Fig. 10.

Sulphate of Potash ($KO, SO_3 = 87$) is found near volcanoes, in a few minerals (Alum and Polhalite), some mineral waters, in many plants, and in some animal secretions. It is formed in large quantities in the preparation of Nitric acid from Nitrate of Potash.

Prop.—Sulphate of Potash is colourless and without odour, of a bitter saline taste; usually seen in small hard crystals formed of six-sided prisms terminated at both ends by six-sided pyramids; the prism is sometimes absent, or the angles are modified, or the crystal is double; the primary form is a right rhombic prism, or rhombic octohedron. The crystals are unalterable in the air, insoluble in Alcohol, but soluble in 16 parts of water at 60° F., and in 4 parts at 212°. They contain no water of crystallisation, but a little mechanically lodged in the interstices; hence they decrepitate when heated, and melt at a red heat. If heated with Charcoal, this salt is converted into Sulphuret of Potassium.

Prep.—B. (1864). Dissolve ℔j. of the *Residue of the Nitric acid process* in *boiling Dist. water* half a gallon, and gradually add to it *Slaked Lime*, until reddened Litmus paper immersed in it is restored to a blue colour Filter the solution through calico, and, having heated it to the boiling point, add *Carbonate of Potash* as long as there is any precipitate. Filter again, add *Dilute*

Sulphuric acid so as to produce a neutral or slightly acid solution, and, having evaporated this till a film forms on the surface, set it by for twenty-four hours. The crystals, which will then have formed, should be dried on filtering paper, and preserved in a bottle.

The residual salt in the manufacture of Nitric′ is Sulphate of Potash, with (generally) an excess of Sulph′. This excess is neutralised with Lime. The rest of the process is complicated, and practically superfluous. The Sulphate of Lime, and Caustic Lime, which the liquid may retain in solution, is precipitated by Carb. Potash. As some Caustic Potash, or excess of Carbonate, may now be present, this is converted into Sulphate by addition of $S\,O_3$.

Tests.—This salt is not liable to adulteration. Its chief characteristics are its sparing solubility in water and insolubility in Alcohol, and that Chloride of Platinum occasions in its solution a yellow precipitate (Chloride of Platinum and Potassium), and Chloride of Barium a white one (Sulphate of Baryta), insoluble in Nitric acid. No change ought to be produced in the colour of Litmus or of Turmeric paper; no precipitate with solution of Oxalate of Ammonia. 132 gr. of (dried) Sulphate Baryta are formed from the precipitation of 100 grains with Chlor. Barium. (L.)

Inc.—Tartaric′, Chlorides of Barium and of Calcium, Acetate and Diacetate of Lead. Nitrate of Silver.

Action. Uses.—Mild Cathartic and Deobstruent.

Dose.—Gr. x.–ʒii.

Pharm. Prep.—Pulvis Ipecacuanhæ Compositus. Pil. Colocynth. Co.

POTASSÆ BISULPHAS.

Bisulphate of Potash. *Potassæ Supersulphas. Sal enixum. F.* Bisulphate de Potasse. *G.* Doppelt Schwefelsäures Kali.

Bisulphate of Potash ($K\,O,\ 2\,S\,O_3+2\,H\,O=145$) is obtained from the residual salt in the manufacture of Nitric′ (by adding an excess of Sulphuric acid, and evaporating to form crystals), and must have been long known; but the mode of preparing it was shown by Link towards the end of the last century. It is not officinal in the B. P.

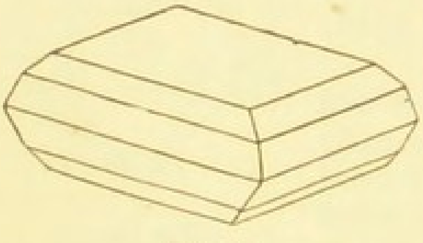
Fig. 11.

Prop.—It is colourless and without odour, but has a very acid bitter taste. It crystallises in small flat prisms belonging to the right rhombic system, when there is an excess of Sulphuric acid. It is very soluble in water, but insoluble in Alcohol; unalterable in dry air; moderately heated, the crystals melt into an oily-looking fluid; at a red heat lose their water of crystallisation and one proportion of acid, and become simple Sulphate of Potash. The solution reddens vegetable blues, and effervesces briskly with alkaline Carbonates.

Tests.—The Sulph′ and Potash may be detected by their respective tests, and this salt may be distinguished from the Sulphate of Potash by the above acid characters.

Inc.—Alkalies, Earths, and their Carbs.; many metals, and Oxides.

Action. Uses.—Purgative. Effervescing Purgative with an equal weight of cryst. Carbonate of Soda.

Dose.—Gr. xx.–ʒij. diluted with water, &c.

Potassæ Sulphas cum Sulphure, *Glaser's Sal Polychrest,* is formed by deflagrating in a red-hot crucible equal parts of Sulphur and Nitre. It contains Sulphate with Sulphite of Potash. It may be used as a mild purgative, and given with an equal weight or more of Bitartrate of Potash. It was formerly much used in Dyspepsia and chronic cutaneous diseases. Dr Duncan says that in use it agrees with the Sulphureous waters. *Dose.*—ʒß–ʒj.

Potassæ Nitras, B.

Nitrate of Potash. Nitre. *Nitrum. Sal Petræ. Saltpetre. F.* Nitrate de Potasse. Nitre. *G.* Salpeter. Salpetersaures Kali.

Nitrate of Potash ($KO, NO_5 = 101$), Nitre, or Saltpetre, being a production of nature, must have been early known, especially as both the Indians and Chinese have long been acquainted with the making of fireworks, and the former have an early process for making Nitric′, in which they have been followed by Geber and other Arabian authors. The names *neter* in the Old Testament, and *nitrum* in ancient authors, were applied to Carbonate of Soda, but they were also used in a generic sense, signifying several substances.

Nitre is found effloresced on the soil in many parts of India, where there is no animal matter, and being washed out, a fresh crop is formed after a few years. The soil is sandy, with mica interspersed, which will continue to yield a supply of Potash, while the Nitric′ must be furnished by the combination of the Oxygen of the atmosphere with its Nitrogen, or, as suggested by Liebig, by the oxidation of the Ammonia, which he has proved is always present in the atmosphere. Mr Stevenson (Prinsep's Journ. ii. p. 23) has detailed the process, and shown that the saline earth contains of salts soluble in water, Sulphate of Soda, Muriate of Soda, Nitrates of Lime and of Potash. The Nitrate of Lime is easily converted into that of Potash by lixiviating the saline soil over a filter of wood-ashes, which contains Carbonate of Potash (the C′ combines with the Lime, and the N′ with the Potash), a Carbonate of Lime is precipitated, and the Nitrate Potash in solution is evaporated and put aside to crystallise. The salt obtained contains from 45 to 70 per cent. of pure Nitrate of Potash. It is redissolved and crystallised, but still contains impurities, which are termed so much per cent. of *refraction.* The ordinary kinds are called *rough* or *crude* Saltpetre, and the purer *East India refined.* In Sumatra Nitrous earth is obtained from large caverns, the soil of which consists mainly of the decomposed dung of bats and birds.

In Europe Nitre is prepared artificially in Nitre-beds or Nitre-walls, and in ditches covered by sheds, where urine is added to different mixtures of earth with refuse vegetables, various animal substances, and calcareous matter, &c. The whole is exposed to the action of the air. The Nitrogen of the decomposing organic matter, becoming oxidised, and combining with the bases, forms Nitrates, and the foregoing processes being adopted, similar results are obtained. (Reichenbach supposes that here also Ammonia is formed first, and suggests to supply it in a more direct way to heaps of earth or ashes containing Potash.)

Prop.—Nitrate of Potash in its purified state is colourless and semi-transparent, without odour, of a sharp and cooling, disagreeable, saline taste; crystallised usually in long, striated, six-sided prisms, terminated at each extremity with dihedral summits, or in two or six converging planes, sometimes in a dodecahedron formed of two six-sided pyramids joined base to base. The crystals are anhydrous and unalterable in the air. Sp. Gr. 1·92. Soluble in 4 parts of water at 60°, producing cold, and in an equal weight of boiling water. Insoluble in Alcohol, and sparingly so in dilute Alcohol. Heated to about 660°, it melts into a transparent fluid; on cooling it forms a white semi-transparent mass, which used to be called *Sal Prunellæ* when run into small balls. By a high degree of heat, Nitre is decomposed, Oxygen gas being first given off, and afterwards mixed with Nitrogen, while Hyponitrite of Potash is left behind. Water is apt to be lodged between the plates of the crystals, particularly when these are large; hence in gunpowder manufactories, small crystals, if equally pure, are preferred. With inflammable substances the decomposition of Nitre, when heated, is rapid, light and heat being disengaged, constituting what is called the deflagration of Nitre. This takes place also with some of the compound acids, into which Carbon enters as a constituent.

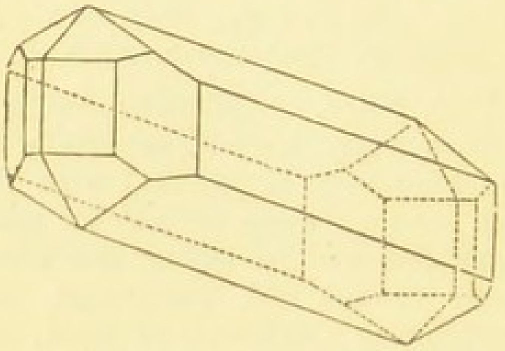

Fig. 12.

Prep.—Nitre being required of the best quality for the manufacture of gunpowder, that of commerce is usually sufficiently pure for medical purposes. It but rarely requires purification by solution, re-crystallisation, and washing, as directed by the B. P.

Tests.—The presence of Nitric′ and of Potash may be detected by their respective tests. "Thrown on the fire it deflagrates; warmed in a test-tube with Sulph. acid and copper wire, it emits ruddy fumes" (Nitrous acid). B. P. Nitre should be entirely soluble in distilled water. The solution should not be affected by Chloride of Barium (no Sulphates), or by Nitrate of Silver (no Chlorides). Calcareous salts, which occur only in rough Nitre, may be detected by the Oxalate of Ammonia throwing down a white precipitate of Oxalate of Lime. Sulphate of Potash is now seldom found in the best Nitre, and only a small proportion of Chloride of Potassium or of Sodium.

Inc.—Sulph′, Alum, the Alkaline and Metallic Sulphates.

Action. Uses.—Refrigerant. Diuretic. In large doses an irritant poison. It has been recommended in Scorbutic diseases, and Acute Rheumatism. *Ext.* Refrigerant and Detergent.

Dose.—Gr. x.–gr. xxx., with sugar, or in water, or in mucilaginous drinks.

Antidotes.—Remove poison from Stomach, allay irritation, and subdue inflammation.

POTASSÆ CHLORAS, B.

Chlorate of Potash. *Oxymuriate* or *Hyperoxymuriate of Potash. F.* Chlorate de Potasse. *Muriate Oxygéné* and *Hyperoxygéné de Potasse. G.* Chlorsaures Natron.

Chlorate of Potash ($K O, Cl O_5 = 122{\cdot}5$), though previously made, was first clearly distinguished from other salts by Berthollet. It is now largely manufactured for the preparation of detonating compounds and lucifer matches.

Prop.—Chlorate of Potash is colourless, in small brilliant scales or quadrangular crystals, glittering and pearly in lustre, not unlike those of Boracic′. Taste cool, penetrating, and austere, something resembling that of Nitre. Like it, the crystals are anhydrous and unalterable in the air. Sp. Gr. 1·98. Soluble in about 30 parts of water at 32° F., in 18 parts at 60°, and at 212° F. in less than 2 parts of water; little soluble in Alcohol. The crystals crackle and become luminous in the dark when rubbed briskly. Heated, they lose about 2 per cent. of water mechanically lodged, melt at a dull red heat, and give out nearly 40 per cent. of Oxygen gas, the Acid and Alkali both being decomposed, and only Chloride of Potassium left. It deflagrates when thrown on live coal, in the same way as Nitre; but detonates violently when rubbed with combustible bodies, as Sulphur, Charcoal, Phosphorus, &c.

Prep.—B. *Chlorine* gas, obtained by acting with $H Cl$ on Binox. Manganese, is passed into a mixture of *Carbonate of Potash* and *Slaked Lime*, in the proportion of 20 to 53 parts, with a little water. When the whole of the gas has passed, the paste which is produced is boiled with water, filtered, and evaporated, that crystals may form.

The quantity of lime used is such that the Carb. Potash is decomposed, forming caustic $K O$ and Carb. Lime. There is still left a large quantity of free lime. The Cl gas acts then on the $K O$ and $Ca O$ as explained below.

[In the old method, Cl was passed into a solution of Carbonate of Potash. The $C O_2$ was displaced. 5 equiv. of $K O$ gave up their oxygen to one of Cl. The Chloric acid united with a sixth equiv. of $K O$ to form Chlorate of Potash. But 5 more equiv. of Chlorine were needed to unite with the Potassium set free and form Chloride of Potassium, which remained in the mother liquor. There was great waste, 6 eq. of Cl and 6 of $K O$ being needed to form one of $K O, Cl O_5$.]

The above mode of preparation was first proposed by Mr Crace-Calvert. Chlorine gas (from H Cl and Binox. Manganese) is passed through a mixture of Lime, Potash, and water. The proportions are those of 6 Eq. of Cl, 5 of Lime, and 1 of Potash. 5 Cl combine with 5 of Calcium, forming 5 Ca Cl, and setting free 5 O. This Oxygen unites with the remaining Eq. of Cl, making Chloric ($Cl\ O_5$), which unites with the Eq. of Potash. Thus there is no loss. The solution is evaporated and the Chlorate crystallised.

Tests.—Entirely soluble. Chloride of Potassium and lime are the most probable impurities. The first is readily detected by Nitrate of Silver, which will give a white precipitate (Chloride of Silver) if any be present; otherwise the solution will be unaffected. Lime will be detected by Oxalate of ammonia. 100 gr. at a red heat give out nearly 39 grains of Oxygen gas.

Action. Uses.—Saline Alterative; Antiphlogistic; supposed to counteract putrescence of the fluids in Scarlatina, Typhus, Cholera. Externally to aphthæ of the mouth and throat.

Dose.—Gr. x.–gr. xxx. It may be given in lozenges, as follows:—

TROCHISCI POTASSÆ CHLORATIS, B. Chlorate of Potash Lozenges.

Prep.—Take of *Chlorate of Potash* in powder, gr. 3600; *Refined Sugar* in powder, ℥xxv.; *Gum Acacia* in powder, ℥j.; *Mucilage of Gum Acacia*, f℥ij. *Distilled water*, f℥j., or a sufficiency. Mix the powders and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains five grains of chlorate of potash. Introduced in 1867.

Dose.—1 to 6 lozenges.

POTASSÆ TARTRAS, B.

Tartrate of Potash. (Bibasic.) *Tartrite of Potash. Kali Tartarizatum. Tartarum solubile. F.* Tartrate de Potasse. *G.* Einfach Weinsaures Kali.

Tartrate of Potash ($2\ K\ O, \overline{T}$, or $2\ K\ O, C_8\ H_4\ O_{10} = 226$) has not been found in nature, but has been known to chemists since the time of Lemery in the seventeenth century.

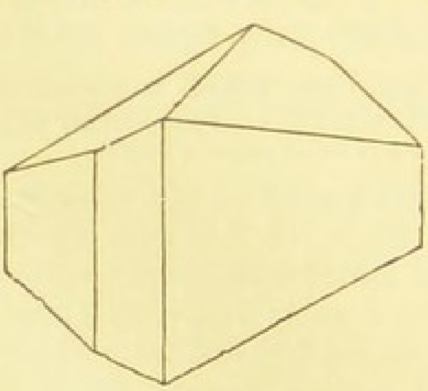

Fig. 13.

Assuming the above formula of Tartaric′, which is generally adopted by chemists, the acid must be considered as *Bibasic*, and this as a *Neutral* or *Bibasic Salt.* (Mr Phillips halves the Eq. of the acid, regarding it as Monobasic.)

Prop.—This salt is colourless, and without odour, but of a bitterish saline taste. It is usually sold in the form of a small granular powder; the evaporation during its manufacture having been carried nearly to dryness with frequent stirring. But it can be crystallised in regular four or six-sided prisms with dihedral summits, the primary form being a right rhomboidal prism. The large cryst. contains 4 Eq. of $H O$ (Thomson). Sp. Gr. 1·55. Deliquescent in the air, soluble in its own weight of water, and in about 240 parts of boiling Alcohol. Heated, it swells up, chars, and is converted into Carb. Potash. "Heated with $S O_3$ forms a black, tarry fluid, evolving inflammable gas, and the odour of burnt sugar." (B.) This is from the decomposition of the Tartaric′. Its solution is readily decomposed by Sul′, or any other strong acid, as well as by several acidulous salts; crystals of the Bitart. being deposited. As in the case of the Bitart., soluble Barytic and Lime Salts, Lime water, and Chlor. Calcuim, Nitr. Silver, and the Acetates of Lead cause white precipitates of Tartrates, which are soluble in N′.

Prep.—B. Dissolve *Carb. Pot.* ℥ix., or q. s. in *boiling aq.* Oijß; add *Acid Tartrate of Potash* powdered ℥xx., or q. s. till neutralised. Boil, filter, and boil, till a pellicle floats. Set aside to cool and crystallise. The remaining liquor will yield more crystals by further concentration and cooling.

Effervescence is caused by the escape of $C O_2$. The Eq. of Potash unites with an Eq. of the Monobasic Supertartrate to form one of the Bibasic Neutral Salt—

$$K O, T + K O = 2 K O, T.$$

This salt is also formed in making Tartaric′ (q. v.), and may be obtained by evaporation.

Tests.—If pure, this Salt is of easy solubility, neutral to Litmus and to Turmeric paper. Most acids, even the Citric, cause a deposit of crystals of the Bitartrate, by combining with half of the Potash. The precipitate occasioned by Chlor. Barium or Acet. Lead is soluble in diluted Nitric′.

113 *gr., heated to redness till gases cease to be evolved, leave an alkaline residue, which is neutralised by* 1000 *measures of volumetric sol. Oxalic acid.*

Inc.—Acids (even Citric′). Acidulous Salts. Soluble Salts of Lime, and of Baryta. Acetate of Lead. Nitrate of Silver.

Action. Uses.—Cathartic. Saline. Affects the urine as an alkali.

Dose.—ʒij.–℥ß.

Potassæ Bitartras. Potassæ Tartras Acida, B.

Supertartrate of Potash. (Acid or Monobasic.) *Bitartrate of Potash. Cream of Tartar. Argol. F.* Tartrate acide de Potasse. *G.* Doppelt Weinsaures Kali.

Bitartrate of Potash ($K O, T, H O = 188$) is well known by the name of Tartar, and must have been known ever since wine has been made from the grape, in the juice of which it exists. During the fermentation of wine, Sugar disappears and Alcohol is formed, and the salt not being soluble in this, is deposited on the bottom and sides of casks, as a crystalline crust, which, according to the colour of the wine, forms either *red* or *white Tartar* or *Argol.* This was known to the ancients, and is the Fæx Vini of Diosc. v. c. 13. (Hindoo Med. p. 97.) Its nature was determined by Scheele in 1769. It is largely purified both at Montpelier and at Venice. It is an acid or supersalt, containing only 1 Eq. of KO to 1 of the acid, whereas 2 are required for the neutralisation of the latter. (Mr Phillips considers it strictly a Bitartrate. 2 Eq. of his Tartaric′ correspond to 1 Eq. of other chemists.)

Prop.—The Bitartrate of Potash of commerce is in white crystalline crusts, formed of clusters of small crystals aggregated together, which are hard and gritty under the teeth, dissolve but slowly in the mouth, and have an acid and rather pleasant taste. The crystals are semi-transparent irregular six-sided right rhombic prisms, or triangular prisms with dihedral summits. Sp. Gr. 1·95. Unaltered in the air, insoluble in alcohol, soluble in 60 parts of water at 60°, and 18 parts at 212°. The solution is acid, reddens Litmus, effervesces with alkaline Carbonates, is liable to become mouldy and decomposed. This is from the growth of the filaments of an algaceous plant, the *Sirocrocis Tartarica*, which also forms in other solutions containing Tartaric acid. The application of heat causes the crystals first to swell up, lose 1 Eq. of water, and then to become decomposed; inflammable gases are evolved, with an odour of burnt sugar, and a mass composed of Carbonate of Potash and of Charcoal is left, which is called *black flux*. If Tartar is deflagrated with its weight of Nitre, *white flux*, or Carbonate of Potash, is left. It is not easily decomposed by acids; its acid (*see* Tar′) will decompose the neutral Potash Salts, Cream of Tartar being produced. Solutions of Baryta and Lime, and of Acetate of Lead, form insoluble white Tartrates of the respective substances. With salifiable bases forming soluble Tartrates, it gives rise to double salts, several of which are officinal, as Potassio-tartrate of Soda, Potassio-tartrate of Antimony (*see* Soda, Iron, Antimony). Bor′ and Borax much increase the solubility of Cream of Tartar, forming BORO-TARTRATE of POTASH, or *Soluble Cream of Tartar*. To form this salt Liebig directs 47½ parts of the Bitart. to be treated with 15½ parts of crystallised Bor′ until the whole be dissolved, and the solution then evaporated to dryness.

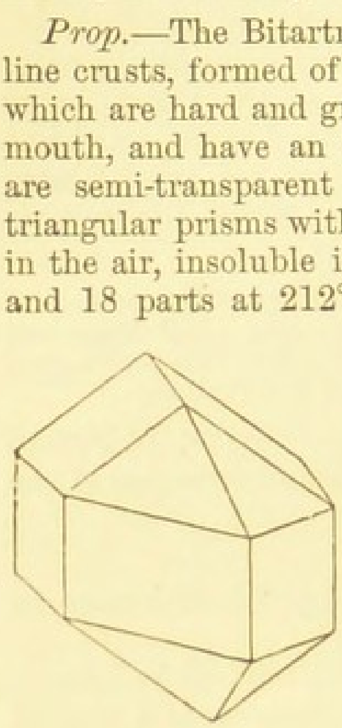

Fig. 14.

Imp.—Bitartrate of Potash contains from 2 to 6, sometimes as much as 14 per cent. of Tartrate of Lime; occasionally powdered white Quartz, or Sand. It ought to be entirely soluble in 40 parts of boiling water. Alum or Bisulph. Potash in powder may be detected by Chlor. Barium.

188 *gr., heated to redness till gas ceases to be evolved, leave an alkaline residue, which is saturated by* 1000 *measures of the volumetric sol. Oxalic acid.* (B.)

Inc.—Strong Acids, Alkaline Carbonates, Salts of Lime and Lead.

Action. Uses.—Refrigerant, Diuretic, Laxative.

Dose.—ʒß–ʒij. as a diuretic. ʒiv.–ʒvj. as a laxative.

Pharm. Prep.—Pulv. Jalapæ Comp. Confectio Sulphuris.

Potassæ Citras, B. Citrate of Potash.

Prep.—B. Dissolve *Citric acid* in crystals, ℥vi. or q. s. in Oij. *Water*, add *Carbonate of Potash*, ℥viij. or q. s. gradually, and, if the solution be not neutral, make it so by the cautious addition of the acid or the Carbonate of Potash. Then filter, and evaporate to dryness, stirring constantly after a pellicle has begun to form, till the salt granulates. Triturate in a dry warm mortar, and preserve the powder in stoppered bottles.

The $C O_2$ escapes with effervescence, and the Citric acid, which is tribasic, combines with 3 equiv. of K O to form the neutral Citrate.

This agreeable saline was first introduced by the compilers of the B. P. (1864.) Citrate of Potash ($3 K O, C_{12} H_5 O_{11} = 306$), as above prepared, is a white powder, excessively deliquescent, so that it must be preserved in a closely-stoppered bottle. It is very soluble in water; its taste is saline, or feebly acid. It is insoluble in alcohol. When prepared from the commercial Carb. Potash, it is apt to contain the soluble impurities of that salt. If made with lemon juice, which contains some malic acid, the Cit. Potash will contain some malate. When the salt is precipitated with a salt of lime, the malate of lime, which is soluble, remains in solution.

Tests.—The qualitative tests are those of Citric acid and Potash. The acid is recognised, like Tartaric′, by the effect of heat or strong $S O_3$ upon it. When Cit. acid is added in excess it forms no precip. in a strong solution of Cit. Potash. It would precipitate the bitartrate from a solution of the Tartrate of Potash. The addition of lime or a salt of lime precipitates the Citrate of Lime. When a solution of Cit. Potash is mixed with one of Chloride of Calcium, however, the precipitate does not form in the cold. The Cit. Lime is more insoluble in hot than in cold water. When the mixture is boiled "a white precip. separates, readily sol. in Acetic acid." (B.) The action of heat on citrates as well as tartrates decomposes the acid into Oxalic′, Acetic′, and other compounds. Heated with $S O_3$, inflammable carburetted hydrogen is among the products of the decomposition. "Heated with Sul′ the Cit. Potash forms a brown fluid, giving off an inflammable gas, and evolves the odour of Acetic acid."

102 *gr., heated to redness till gases cease to be evolved, require for saturation* 1000 *measures of the volumetric sol. of Oxalic acid.*

Action. Uses.—An excellent mild refrigerant, diaphoretic, and diuretic, in doses of gr. xx.–gr. lx. In large doses, purgative. It may be employed with lemon juice to form a cooling drink in fevers. It acts as an alkali upon the urine, and may be given as an anti-lithic, in acidity, and in gout.

POTASSÆ ACETAS, B.

Acetate of Potash. *Kali Acetatum. Sal Diureticus. Terra foliata Tartari. Digestive Salt of Sylvius. F.* Acetate de Potasse. *G.* Essigsaures Kali.

Acetate of Potash ($K\,O, \overline{A}$, or, $K\,O, C_4H_3O_3 = 98$) was known to Raymond Lully in the thirteenth century, and probably earlier. It is found in the sap of many plants, as in some of those which by incineration yield Carb. Potash.

Prop.—It is colourless, and with little odour, but has a sharp saline taste. It is usually seen as a shining foliated mass, made up of small pellucid scales, but by slow evaporation it may be made to crystallise in thin compressed laminæ, or in needles. It is so deliquescent as soon to become converted into an oily-looking liquid when exposed to the air. It is soluble in its weight of water; also in Alcohol. Subjected to heat, it fuses, and then becomes decomposed. Hydrogen and Carb′ escape. Carb. Potash, as in the case of the Tartrates, remains a residue. Acetate of Potash is decomposed by Sul′ and other strong acids, giving off an odour of Acetic acid; and also by several Salts. Comp. per cent., Pot. 48·5 + Ac. 51·5 = 100.

Prep.—B. To *Acetic acid*, Oij. or q. s., placed in a thin porcelain basin, add gradually *Carbonate of Potash*, ℥xx., filter, acidulate, if necessary, with a few additional drops of the acid, and, having evaporated to dryness, raise the heat cautiously so as to liquefy the product. Allow the basin to cool, and when the salt has solidified, and while it is still warm, break it in fragments and put it into stoppered bottles.

The Acetic′ unites with the Potash, expelling the Carb′ gas.

When distilled Vinegar is used, the solution always becomes brown. It is best to use pure Acetic′ diluted. To prevent an excess of Potash from browning the product, some excess of acid should be employed. This salt may also be obtained by double decomposition between Acetate of Lead and Sulphate of Potash; but it then sometimes contains Lead.

Tests.—Sulphuric acid disengages Acetic vapours; a red heat converts it into Carb. Potash. Entirely soluble in water and Alcohol: should not affect either Litmus or Turmeric, though it is apt to have an alkaline reaction. With a dilute solution of perchloride of iron, it strikes a blood-red colour. Its solution is not affected by Chlor. Barium or Nitr. Silver (showing absence of Sulphates and of Chlorides). But if the solution be strong, a precipitate may be formed by the silver test. This, however, is soluble in water or in Nit′. If metals are present, as Lead, Hydrosul′ will give a blackish precipitate. Copper is further precipitated brown by Ferrocy. Potassium.

Inc.—Acids. Sulphates of Soda and Magnesia, and several earthy and metallic Salts.

Action. Uses.—Diuretic; in large doses acts as a purgative. If continued, will render the urine alkaline as Carb. Potash does, for, like other salts of the Alkalies with vegetable acids, it is apt to be converted into a Bicarbonate while in the system. (Wöhler.)

Dose.—Gr. x.–ʒj. as a diuretic. ʒj.–ʒiij. as a cathartic.

POTASSÆ PERMANGANAS, B. Permanganate of Potash.

This is a combination of Potash with the most highly oxidised form of the metal Manganese. It consists of 1 Eq. of Potash and one of the Permanganic Acid ($KO, Mn_2 O_7$). It occurs in prismatic crystals of a deep purple colour, very soluble in water, and with a sweet astringent taste.

Prep.—B. Reduce *Chlorate of Potash*, ℥iijß to fine powder, and mix it with *Oxide of Manganese*, ℥iv.; put the mixture into a porcelain basin, and add to it *Caustic Potash*, ℥v., previously dissolved in four ounces of *Dist. water*. Evaporate to dryness on a sand bath, stirring diligently to prevent spurting. Pulverise the mass, put it into a covered Hessian or Cornish crucible, and expose it to a dull red heat for an hour, or till it has assumed the condition of a semifused mass. Let it cool, pulverise it, and boil with a pint and a half of *Dist. water*. Let the insoluble matter subside, decant the fluid, boil again with half a pint of *Water*, again decant, neutralise the united liquors accurately with *Dilute Sulphuric acid*, q. s., and evaporate till a pellicle forms. Set aside to cool and crystallise. Drain the crystalline mass, boil it in six ounces of *Water*, and strain through a funnel the throat of which is lightly obstructed by a little asbestos. Let the fluid cool and crystallise, drain the crystals, and dry them by placing them under a bell jar over a vessel containing Sulphuric acid.

When black Oxide of Manganese ($Mn O_2$) is heated with Chlorate of Potash, the latter yields its oxygen up, so that $Mn O_3$ and $Mn_2 O_7$ are formed, which unite with the caustic KO. The mass in the crucible will contain Permanganate and Manganate of Potash with Chloride of Potassium, some $Mn O_2$ unoxidised, and some KO in excess. The solution in hot water decomposes the Manganate into Permanganate and $Mn O_2$. Decanting gets rid of the oxide; the KO is neutralised by Sulphuric acid, and when the salt is crystallised out, the remaining liquid contains Sulphate of Potash, and Chloride of Potassium. The cryst. are sol. in 16 parts of water, at 60°. "A single small crystal forms, with an ounce of water, a rich purple solution." (B.) When heated to redness they decrepitate, evolve oxygen gas, and leave a black residue of $Mn O_2$ and KO. The readiness with which it yields up its oxygen characterises this salt. A protosalt of iron, or an organic compound, decomposes it at once. A sufficient quantity of a deoxidiser removes 3 equiv. of Oxygen from the solution of Permanganate, leaving Black Oxide of Manganese, which subsides, and Potash. The solution, from a deep red, becomes colourless—

$$KO, Mn_2 O_7 - 3\,O = KO + 2Mn\,O_2 .$$

The Manganate of Potash, the solution of which is green, yields up Oxygen with the same facility, but in less quantity. These solutions, like other oxidisers, decompose HS, remove bad smells, and are thus termed disinfectants. The B. P. gives the following quantitative test:—"5 gr. of the Permanganate dissolved in water, require for complete decoloration a solution of 44 gr. of granulated Sulphate of Iron acidulated with 2 dr. of dil. Sulph. acid." Persulphate of Iron is formed. The precipitated $Mn\ O_2$ may be recognised by its tests.

Action. Uses.—This salt is not much used internally. It would be decomposed immediately by the animal fluids. It has been given in diabetes on the presumption that it supplies Oxygen, and so promotes the transformation of sugar in the system.

Dose.—Gr. iii.–gr. v. in a considerable quantity of water. The powder, mixed with chalk, may be dusted over fetid sores.

LIQUOR POTASSÆ PERMANGANATIS, B. Solution of Permanganate of Potash.

Prep.—B. Take of *Permanganate of Potash*, gr. iv.; *Dist. water*, f ℥j. Dissolve.

This solution is analogous to Condy's "disinfecting fluid." It is an admirable deodoriser for the sick-room. It may be further diluted to form a wash for cancerous or foul sores, or a gargle for fetid breath or putrid sore throat. It has been given internally in diabetes and other disorders.

Dose.—ʒij.–ʒiv.

POTASSII FERROCYANIDUM. POTASSÆ PRUSSIAS FLAVA, B. (*See* COMPOUNDS OF IRON.)

POTASSÆ BICHROMAS, B. Bichromate of Potash ($K\ O,\ 2\ Cr\ O_3$) is rarely used as a medicine, though chemically interesting. It is employed in the preparation of medicines, as an oxidising agent, and as a test.

SODIUM.

NATRIUM. *F.* Sodium. *G.* Natrium.

Sodium or *Natrium* (N = 23) is the metallic base of Soda, discovered by Sir H. Davy in 1837. It is of the consistence of wax, malleable, and spreads into thin leaves. Sp. Gr. 0·972. Opaque, but with a brilliant silvery lustre; floats on water, producing a hissing effervescence, in consequence of the escape of Hydrogen, while the Oxygen of the water combining with the Sodium (sometimes with explosive violence), forms a Protoxide, or Soda, which remains in solution. Sodium fuses at 190°, and volatilises at a white heat. It conducts both Heat and Electricity. It exists in Sea water and Rock Salt, in combination with Chlorine. As it oxidises in the air, it must be preserved under Naphtha. The compounds of Sodium are recognised in *spectrum analysis* by their producing a bright line across the yellow portion of the spectrum, while those of Potassium show a bright line at the limit of the red, and another at the opposite limit of the violet, those of Lithium a bright line in the red and a paler line across the yellow portion of the spectrum.

SODA. Protoxide of Sodium.

Mineral or Fossil Alkali. *F.* Soude. *G.* Nâtron. *Natron* or *Nitron* of the Ancients (but these names apply rather to the Carbonates, q. v.)

Soda ($Na\,O = 31$) is obtained by adding Caustic Lime to a solution of Carbonate of Soda; a precipitate takes place of Carbonate of Lime. The Soda being left in solution, may, by evaporation, be obtained as Hydrate of Soda ($Na\,O, H\,O = 40$). Soda is found to be a constituent of several minerals, as Sodalite, &c., and is very abundant in combination with different acids. It has been obtained in four-sided crystals, acuminated by four planes, of a greyish-white colour; acrid and caustic, soluble in both water and Alcohol; melting at a red heat, and efflorescing in the open air. Its properties are very similar to those of Potash. The affinity of Soda for water in the air is less; it first becomes moist, absorbs Carbonic′, and effloresces. Glass and Soaps made with Soda are harder than those made with Potash. The Salts differ in their forms from those of Potash; less Soda will saturate a given quantity of acid; and Soda Salts are for the most part more soluble than the corresponding ones of Potash. They do not yield crystals of Alum, when added to a solution of Sulphate of Alumina; nor an insoluble Bitartrate on addition of Tartaric′; and Chloride of Platinum throws down no precipitate. They may be distinguished from the alkaline earths by no precipitate taking place on addition of Carbonate of Potash or of Soda; while the alkaline Ferrocyanides and Hydrosulphurets, which distinguish Metallic Salts, cause no precipitates in solutions of salts of Soda.

Tests.—The only positive tests are, that Soda and its Salts give a rich yellow tinge to the flame of Alcohol, and when in solution, are precipitated by a solution of Antimoniate of Potash. The results of *spectrum analysis* are characteristic.

Action and Uses of Soda and its Salts.—Soda very much resembles Potash in its medicinal action. The same may be observed of its salts and those of Potash. Soda and its compounds differ from the Potash series in being less corrosive and perhaps less powerful as Alkalies; in their rather greater tendency to act as cathartics, and diminished liability to pass into the urine; and as being less active as Alterative agents. In cases of Gravel Soda is not generally recommended, on account of the Lithate of Soda being more insoluble than that of Potash. But the Carbonates of Soda are well suited for cases of Acid Dyspepsia. The Chloride of Sodium has a mild alterative influence over Scrofulous disorders. The Sulphate and Potassio-tartrate are in common use as Purgatives. The Phosphate has been employed in the removal of Lithic deposits, which it is thought to be capable of dissolving. The Chlorinated Soda is an exceptional compound, the value of which depends on the Chlorine which it evolves.

SODA CAUSTICA, B. Caustic Soda. Hydrate of Soda.

The hydrated Protoxide of Sodium (Na O, H O) is prepared in the same way as Caustic Potash, and possesses very similar properties.

Prep.—B. Boil down *Solution of Soda*, Oij., rapidly in a silver or clean iron vessel, until there remains a fluid of oily consistence, a drop of which, when removed on a warmed glass rod, solidifies on cooling. Pour the fluid on a clean silver or iron plate, and, as soon as it has solidified, break it in pieces, and preserve it in stoppered green-glass bottles.

It is obtained in greyish fragments, very alkaline and corrosive. The B. P. states that if dissolved in water acidulated with Nit. Acid it gives scanty white precipitates with Nit. Silver and Chlor. Barium, thus allowing of the presence of a minute quantity of sulphates and chlorides. Dissolved in water, it should leave scarcely any sediment. 40 *gr. require for neutralisation about* 900 *measures of the volumetric sol. Oxalic acid.*

Action. Uses.—Similar to those of Caustic Potash. It is less caustic and less deliquescent.

LIQUOR SODÆ, B. Liquor Sodæ Causticæ. Solution of Caustic Soda.

Prep.—B. Dissolve ℥xxviij. *Carbonate of Soda* in *Dist. water*, Cj.; and, having heated the solution to the boiling point in a clean iron vessel, gradually mix with it *Slaked Lime* ℥xij., and continue the ebullition for ten minutes with constant stirring. Then remove the vessel from the fire; and when, by the subsidence of the insoluble matter, the supernatant liquor has become perfectly clear, transfer it by means of a siphon to a green-glass bottle furnished with an air-tight stopper.

The lime combines with the Carb. Acid, as in the preparation of Liquor Potassæ. If not properly prepared, the solution may contain $C\ O_2$, when it effervesces with dilute Hydrochloric acid, and gives a precipitate with lime,—or lime, when it is precipitated by Oxalate Ammonia. The Sp. Gr. is 1·047. 100 gr. contain about 4 of Soda. ℥j. (458 *gr.*) *is neutralised by* 470 *measures of the volumetric sol. Oxalic acid.*

In the process for the manufacture of Carb. Soda from common salt, a solution of impure Caustic Soda generally remains after the separation of the Carbonate. It contains iron, and is called *red liquor*. Caustic Soda is prepared from it by manufacturers on the large scale.

In most characters this solution resembles Liq. Potassæ. It differs from that in giving a precip. with Antimoniate of Potash, and none with Tartaric acid, Fluosilicic acid, or Bichloride of Platinum. Its chemical and therapeutical applications are similar to those of Potash, than which it is a weaker base, and a less active remedy.

Uses.—Chiefly Pharmaceutical. The B. P. employs it in the preparation of Caustic Soda, Sulphurated Antimony, and Valerianate of Soda. It is also employed in volumetric analysis. (See Appendix.)

SODÆ CARBONAS.

Carbonate of Soda. *Sodæ Subcarbonas. Aerated Mineral Alkali. Fossil Alkali.* (One of the kinds of *Nitrum* of the Ancients.)

Carbonate of Soda is the *neter* of the Hebrews. It was known to the early Hindoos, and is by them called *Sajji noon* (i.e., *Sajji* or Soda Salt); it is the *Sagimen vitri* of Geber. The Natron lakes of Egypt were known to the ancients, and it was early employed in glass-making, &c.

SODÆ CARBONAS IMPURA. Impure Carbonate of Soda, or Barilla. *F.* Soudes de Commerce. Soudes brutes. *G.* Kohlensaures Natron.

The substance known by the name of Soda is a Carbonate of Soda, but mixed with various impurities, according to the source whence it has been obtained; that is, either from the Natron lakes, from the burning of maritime plants or sea-weeds, or from the decomposition of other salts of Soda. It is used in Pharmacy for the purpose of obtaining from it pure Carbonate of Soda.

BARILLA is the Ash obtained by burning plants, on the shores of the Mediterranean, of the Red Sea, and Indian Ocean. These plants belong mostly to the natural family of Chenopodeæ, and chiefly to the genera Salsola, Salicornia, Suaeda, and Chenopodium. The quantity of Carbonate of Soda in the ash varies from 25 to 40 per cent., and is produced by the combustion of various Salts of the Vegetable acids. The Soda is no doubt obtained from the soil, for Du Hamel planted Soda-plants inland, and they yielded only Potash. Infusion of a Salsola in cold water afforded by evaporation two salts, Carbonate of Soda and Chloride of Sodium. *Murr. Chem.* ii. p. 612. A portion of the Chloride is no doubt converted into the Carbonate during the incineration.

KELP used to be prepared on the coasts of Scotland and its islands, also on those of Ireland and Wales, and on that of Normandy in France, by burning a great variety of Algæ or Sea-weeds. The ashes when cold form *Kelp*, which is in hard cellular masses, of a bluish-grey colour, and of a disagreeable alkaline taste, containing from 3 to 8·5 per cent. of Carbonate of Soda, and other salts, as in the case of Barilla, but also some Potash and Iodine. (*See* p. 45).

Carbonate of Soda is, however, now obtained very cheaply from Chloride of Sodium or Sea-Salt. This is first converted into Sulphate of Soda by the action of Sul′, then mixed with pounded small Coal and Chalk, and heated in a reverberatory furnace and stirred. The Carbonaceous matter abstracts Oxygen both from the Sul′ and the Soda; Sulphuret of Sodium is formed, and decomposed by the Lime; Carbonate of Soda, insoluble Oxi-Sulphuret of Calcium, Caustic Soda, and Carbonaceous matter, being the result. The insoluble parts are separated by Lixiviation, and the Sulphur subsequently burnt away, during which the Soda is completely Carbonated. The mass now contains about 50 per cent. of Soda. Being lixiviated and evaporated, the Carbonate is obtained in large crystals. As Barilla is not sufficiently pure for medicinal purposes, lixiviation, evaporation, and crystallisation are necessary, to bring it up to the purity required by the Colleges.

SODÆ CARBONAS, B. Carbonate of Soda. *Natron præparatum.*

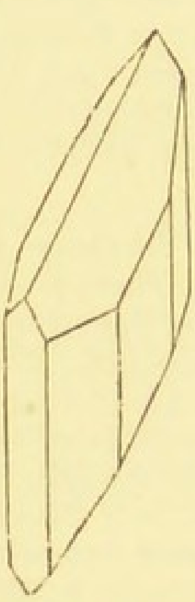

Fig. 15.

Carbonate of Soda ($Na\ O, C\ O_2 + 10\ Aq. = 143$), prepared as above, is in large and clear colourless crystals, without odour, but having a disagreeable sub-alkaline taste, and an alkaline reaction on Turmeric. The crystals are oblique rhombic prisms, or rhomboidal octohedrons, entire or broken. In the air they effloresce, but, when exposed to heat, melt in their water of crystallisation; as this is dissipated, the Salt becomes a white, porous, anhydrous mass, known as dried Carbonate of Soda. Water at 60° dissolves half, and at 212° its own weight of this salt, but it is insoluble in Alcohol. It has the characteristics of a Carbonate with Acids and Earths, and is distinguished from the Bicarbonate by giving a brick-red precipitate with Chloride of Mercury, and a white one (Carbonate of Magnesia) with Sulphate of Magnesia. It is used for the purpose of converting Oils and Fats into Soap. Composed per cent. of $Na\ O$ 22·2, C' 15·3, Aq. 62·5 = 100.

Tests.—Carbonate of Soda prepared from the Sulphate is usually very pure, but the Salt is apt to contain some Sulphate of Soda, and also the Chlorides of Sodium and of Potassium. The following are characteristics of purity. It is colourless, translucent, efflorescent in the air, soluble in water. This solution changes the colour of Turmeric to brown. When supersaturated with $H\ Cl'$, Chlor. Barium throws down from it no precipitate (absence of Sulphates), nor does Nit. Silver (Chlorides), nor Bichloride of Platinum (Potash). 100 grains of the Carbonate lose 62·5 (63, B.) of Water at a red heat, and the same quantity gives off 15·28 gr. of Carbonic' on the addition of dil. $S\ O_3$. 143 *gr. are neutralised by* 960 *measures of the volumetric sol. Oxalic acid.*

Inc.—Acids, Acidulous Salts, Lime water, Hydrochlorate of Ammonia, Earthy and Metallic Salts.

Action. Uses.—Antacid; in large doses, irritant poison. Diuretic, Antilithic.

Dose.—Gr. x.–ʒß or ʒj. For effervescing draughts, gr. xx. = gr. x. of Cit' or Tar', and fʒijß of Lemon juice. Used also for Seidlitz Powders.

Antidotes.—Fixed Oil, Vinegar, Lemon juice, Cream of Tartar.

SODÆ CARBONAS EXSICCATA, B. Dried Carbonate of Soda.

Dried Carbonate of Soda ($Na\,O,\ C\,O_2 = 53$) is the result of the expulsion of the whole of the water of the crystallised Salt, so that 53 grains of the Anhydrous Salt are equal to 143 grs. of the Crystallised Salt. Composed of Na O, 59·3 + C′ 40·7 = 100. It requires to be heated to redness, that it may be of uniform strength.

Prep.—B. Apply a strong sand heat in a porcelain capsule to *Carb. Soda* until the crystals liquefy, and then change to a dry cake; rub to powder, and enclose in stoppered bottles. (A more elegant preparation, and more easily powdered, is formed by heating the *Bicarbonate* to redness.)

Dose.—Gr. v.–gr. x. in powder or in pills.

SODÆ SESQUICARBONAS.

Sesqui-Carbonate of Soda. Natron. *F.* Natron. *G.* Anderthalb Kohlensaures Natron.

A Sesquicarbonate of Soda ($2\,Na\,O,\ 3\,C\,O_2,\ 4\,H\,O = 164$) exists in nature, from the Trona found near Tripoli in Africa, the Natron of the country to the west of the Delta of the Nile, and of the Lonar Lake in the Deccan, described by the late Dr Malcolmson,* have all been proved to consist of 3 Eq. of Carb′ to 2 of Soda; or Na O 38·55 + C′ 39·76 + Aq. 21·69 = 100. A solution of it may be obtained by heating Bicarbonate of Soda in solution to a temperature of 212°. The salt so called until lately in the L. P. has been proved by Mr Everett to be a Bicarbonate, q. v.; and Dr Pereira has stated that by the process given a Bicarbonate will always be produced. This Lake Carbonate is probably, like Sesquicarb. Ammonia, compounded of the Carb. and Bicarb.

SODÆ BICARBONAS, B.

Bicarbonate of Soda. *Sesquicarbonate.* *F.* Bicarbonate de Soude. *G.* Zweifach Kohlensaures Natron.

The Bicarbonate of Soda ($Na\,O,\ 2\,C\,O_2,\ H\,O = 84$) which is met with in commerce is usually a pure salt, but occasionally mixed with a small portion of the Carbonate. It exists in some mineral springs highly acidulated with Carb′, as in those of Vichy.

Prop.—As usually sold, it is colourless, in powder, or in minute scale-like crystals, having a saline, slightly alkaline taste and reaction. Little changed in the air. Soluble in 13 parts of water at 60° (Rose and Geiger), but in much less boiling water. Hence it crystallises as the hot solution cools. Heated, it first loses a portion of water, then half its Carb′, finally all its water, and becomes reduced to dried Carbonate of Soda. It is easily distinguished from this salt, *i.e.* the Carbonate, by its less alkaline taste, less solu-

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* The analyses were made in the Laboratory, and the specimens are deposited in the Museum of King's College.

bility, and by not forming a white precipitate on the addition of Sulphate of Magnesia to its solution; nor is a brick-red precipitate formed with Chloride of Mercury, but only a slight opalescence.

Prep.—It is made on the large scale by exposing cryst. of Carb. Soda to a continuous current of Carb. Acid gas. This they slowly absorb, evolving much heat and watery vapour. The B. P. prepares it by passing the gas (obtained from HCl of commerce and fragments of marble) through a mixture of the Carbonate with 1½ parts of dried Carbonate to saturation. The salt is purified by agitation with half its weight of dist. water, and the residue dried on filtering paper placed on porous bricks.

Tests.—Entirely soluble in water. This solution should not be precipitated by Chlor. Platinum, or by the other tests for Potash, showing the absence of this alkali. The absence of Sulphates and Chlorides is proved by Chlor. Barium and Nitr. Silver causing no precipitate in a solution saturated with Nitr′—(slight precipitates, B.) It is most liable to contain a portion of Carb. Soda. This will of course give to it a stronger alkaline reaction and a more disagreeable taste. Its presence is detected by Sulph. Magnesia producing a white precipitate, whereas none is formed by sol. of the Bicarb. unless when heated. It gives a white, and not a coloured precipitate with Perchlor. Mercury. A solution of 40 parts of water does not give an orange precipitate with solutions of Corrosive Sublimate, unless with the aid of brisk agitation, long standing, or heat, but a reddish-brown precipitate forms at once if so much as a hundredth part of the Carb. be present. (*c.*) 100 grs. of this salt, added to dilute Sulphuric acid, evolve 51·7 grains of Carbonic acid. It loses a part of its CO_2 at 212°. At a red heat it is converted into the anhydrous Carbonate. 84 *gr. at a red heat leave* 53 *of an alkaline residue, which is neutralised by* 1000 *measures of the volumetric sol. Oxalic acid.*

Inc.—The same as the Carbonate, except Sulph. Magnesia, with which it may therefore be prescribed.

Action. Uses.—Antacid, Antilithic, Diuretic. In Gastrodynia, Dyspepsia, Gout, Lithic deposits.

Dose.—Gr. x.–ʒß or ʒj. For making effervescing draughts, 20 grs. = 17 grs. Cit′ or 18 grs. Tar′.

TROCHISCI SODÆ BICARBONATIS, B. Bicarbonate of Soda Lozenges.

Prep.—Take of *Bicarbonate of Soda*, in powder, gr. 3600; *Refined Sugar*, in powder, ℥xxv.; *Gum Acacia*, in powder, ℥j.; *Mucilage of Gum Acacia*, f℥ij.; *Distilled water*, f℥j. Mix the powders and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Introduced in B. 1867 from old E. P. Each lozenge contains five grains of bicarbonate of soda.

Dose.—1–6 lozenges.

PULVERES EFFERVESCENTES. Soda Powders.

These are the common Soda Powders, for which we may take Bicarb. of Soda, gr. xx., and dissolve in Aq. f℥jß–f℥iij. in a tumbler, and add ½ oz. of Lemon juice, or of Tar′ or Cit′ gr. xviij. dissolved in a little water, and drink while in a state of effervescence; a Citrate or Tartrate of Soda will be formed. By adding ʒj. or ʒij. of Rochelle Salt, or Sulphate of Magnesia, an aperient salt may be presented in the agreeable form of an effervescing draught. It must be remembered that Citrates and Tartrates become converted into Carbonates, and will, if long taken, have an alkaline reaction on the secretions, as on that of urine.

LIQUOR SODÆ EFFERVESCENS, B. Effervescing Solution of Soda. Aqua Sodæ Effervescens, E. P. Soda Water.

Prep.—Take of *Bicarbonate of Soda*, gr. xxx.; *Water*, Oj. Dissolve the bicarbonate of soda in the water and filter the solution; then pass into it as much pure washed Carbonic acid gas, obtained by the action of Sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.

It effervesces strongly when the containing vessel is opened, Carbonic acid gas escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste. f℥x. *after being boiled for five minutes, require for neutralisation* 178 *grain measures of the volumetric sol. Oxalic acid.* (Introduced in 1867, from E. P.)

Soda water should be of this composition; but what is commonly so called is only a solution of Carb′ as in water. By adding some Bicarb. Soda to such Soda water an equally efficient mixture will be formed. But the effects of the simple Carb′ gas in water and those produced when it is combined with an alkaline salt will necessarily be different. The Carb′ gas as it escapes will stimulate the stomach, while this effect will be followed by an alkaline reaction when Soda (or Potash) is present, and this may be beneficial or injurious according to the nature of the case.

Carbonic acid gas is found in many mineral waters, to which it gives an acidulous taste and sparkling effervescence. In some it occurs with Carbonate or Bicarbonate of Soda, in others with Iron, and its effects are necessarily modified according to the nature of these ingredients.

SODII CHLORIDUM, B.

Chloride of Sodium. Common Salt. *Muriate of Soda. Sal Fossile. Sal Marinum. Sal Gemmæ. F.* Chlorure de Sodium. *G.* Chlor. Natrium.

Chloride of Sodium ($\mathrm{Na\,Cl} = 58{\cdot}5$), or Common Salt, is abundantly diffused in nature, and, being an essential article of diet, must have been known from the earliest ages. It is found in many animal solids and fluids, and in the juices of some vegetables. It exists in large quantities in the solid form as Rock Salt, in solution in some springs, and everywhere in Sea water. From these waters it is obtained by evaporation, when it crystallises with slight variations of appearance according to differences in the process. These varieties are known by different names in commerce, as Butter, Stone, and Basket Salt, also Sea Salt, and, in large crystals, as Malden, Fishery, and Bay Salt. Most of the kinds of Salt require purification, by being again dissolved and recrystallised (Sodæ Murias Purum, E.), for they are apt to contain other salts, as alkaline and earthy Sulphates and Chlorides, especially of Magnesium and of Calcium.

Prop.—Common Salt crystallises in anhydrous transparent cubes; these are sometimes aggregated together, forming hollow four-sided pyramids with their sides in steps. Sp. Gr. = 2·17; colourless when pure. Taste saline, well known; no odour; it does not affect either Litmus or Turmeric. Neither does it bleach. 1 part requires 2½ times its weight of water to dissolve it, and its solubility is not much increased by a boiling temperature. It is insoluble in pure Alcohol, but slightly soluble in rectified Spirit, to the flame of which it gives a yellow tinge. Salt readily transmits radiant heat. When heated, it decrepitates; at a red heat, fuses and sublimes. Inalterable in the air when pure; but when impure, it deliquesces. Sul′ and Nit′ decompose Salt, as also Bor′ and Phosp′ with the assistance of heat. Nitr. Silver, the Protoxides of Lead and Mercury, Lime, Potash, and with the aid of heat, Carb. Potash, all decompose this salt. Like all Chlorides, it gives with Nitr. Silver a precipitate of Chlor. Silver, soluble in $N H_3$, insoluble in $N O_5$. It is distinguished from a Potash Salt by giving no precip. with Bichlor. Platinum. When dissolved in water, it is supposed by some chemists to become a Hydrochlorate of Soda, from the water being decomposed, its Oxygen combining with the Sodium, and the Hydrogen with the Chlorine; then its composition will be $Na O, H Cl$. Salt is composed per cent. of Na 40 + Cl 60 = 100.

Tests.—Scarcely any precipitate should be occasioned by Carb. Soda or Nitr. Bar.; the first indicating the absence of earthy salts, and the latter of Carbonates and Sulphates. (It often contains a little Sulphate of Magnesia, sometimes also a Chloride of Magnesium, by which it is rendered deliquescent.) A solution is not precipitated by Sol. Carb. Am. followed by Sol. of Phosph. Soda. The former would detect Lime, and, after its addition, the latter would indicate Magnesia.

Action. Uses.—Irritant externally. Alterative, Emetic, Cathartic; has been used also in Scrofula, Ague, and malignant Cholera.

Dose.—Gr. x.–ʒj. as an Alterative. ʒiv.–℥j. Cathartic. ℥jß–℥ij. with warm water, as an Emetic. ℔j. of Salt to every 3 gallons of water, will make a bath of the strength of Sea water.

Liquor Sodæ Chloratæ, B.

Solution of Chlorated or Chlorinated Soda. Hypochlorite of Soda. Chloride of Soda. Labarraque's Soda Disinfecting Liquid. *F.* Chlorure de Soude. Chlorure d'Oxyde de Sodium. *G.* Chlornatron.

M. Labarraque in 1822 made known the utility of Chlorinated Soda as a disinfectant, &c., and obtained the prize of the French

Society for encouraging National Industry for proposing it as a means for preventing, stopping, and destroying putrefaction.

Prop.—It is a solution of the Hypochlorite of Soda (Na O, Cl O) with Bicarbonate of Soda, and Chloride of Sodium. The solution, by careful evaporation, yields crystals, which, when redissolved in water, produce a solution similar to the original one. This is of a pale yellowish colour (colourless, B.), has a slight odour of Chlorine, and a sharp but somewhat astringent taste. It has first an alkaline reaction on Turmeric paper, from the presence of Bicarbonate of Soda, and subsequently destroys its colour, as well as that of Sulphate of Indigo, from the presence of Chlorine. Exposed to the air, it becomes decomposed, Chlorine being evolved. Carbonate of Soda is left. Chlorine as well as Carb′ gas is evolved on the addition of acids, Chloride of Sodium being left in solution. Lime water produces a white precipitate, indicating the presence of Carb′. It may be distinguished from Chlorinated Potash by Chloride of Platinum not producing the usual yellow precipitate, and from Chlorinated Lime by Oxalate of Ammonia causing no precipitate. The term Chloride of Soda, which has been applied to this substance, would, if strictly understood, indicate a compound to which we know of no parallel in Chemistry. Chemists are not unanimous as to its real constitution. The most generally received opinion, and that adopted by Dr Pereira, is, that it is composed of 2 Eq. Bicarb. of Soda + 1 Eq. Hypochlorite of Soda + 1 Eq. Chloride of Sodium.

Prep.—B. Dissolve *Carb. Soda*, ℥xij., in *Dist. water*, f℥xxxvj.; then put *Binox. Manganese*, ℥iv., and *Hydrochloric acid*, ℥xv., into a flask with bent tube attached. Heat the mixture and pass the Chlorine gas first through f℥iv. of *water*, and then through the solution of the *Carbonate*. When the disengagement of Cl has ceased, transfer the solution in which it has been absorbed to a stoppered bottle, and keep it in a cool and dark place.

The changes taking place may perhaps be represented by the following equation :—

$$4\,(\mathrm{Na\,O,\ C\,O_2}) + 2\,\mathrm{Cl} = 2\,(\mathrm{Na\,O,\ 2\,C\,O_2}) + \mathrm{Na\,O,\ Cl\,O} + \mathrm{Na\,Cl}.$$

Tests.—Sp. Gr. 1·103. It is not precipitated by Oxalate Ammonia. 70 *gr. by weight with* K I xx. *gr. in water*, ℥iv., *acidulated with* H Cl ʒij. *requires, to discharge the brown colour produced* (*Iodine*), 500 *measures of the volumetric sol. of Hyposulphite of Soda.* (B.)

If instead of Carbonate of Soda we employ Carb. Potash, we shall have the *Eau de Javelle* or *Chlorinated Potash*, first employed in bleaching in 1789, but little used in medicine.

Action. Uses.—Disinfectant and Antiseptic. Contains Chlorine, and, like it, has an alterative action in the blood in Scrofulous and Syphilitic disorders.

Dose.—♏x.–♏xx.

Cataplasma Sodæ Chloratæ, B. Poultice of Chlorinated Soda. Chlorine Poultice.

Prep.—Add *powdered Linseed*, ℥iv., to *boiling water*, f℥viij.; then mix in *Solution of Chlorinated Soda*, f℥ij., stirring constantly.

Use.—An excellent application to foul sores and sloughing ulcers, and gargle to putrid sore throat, destroying the fœtor.

Borax, B. Sodæ Biboras.

Biborate of Soda. *Borate of Soda. F.* Borax. Borate de Soude. *G.* Boraxsaures Natron.

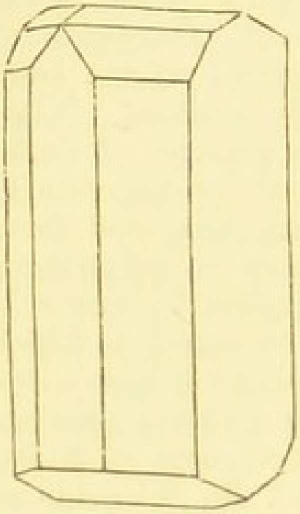

Fig. 16.

Borax, or ($\mathrm{Na\ O,\ 2\ B\ O_3 + 10\ Aq.} = 191$) Biborate of Soda, is supposed to have been known to the ancients, and to have been the *Chrysocolla* of Pliny. The Hindoos have long been acquainted with it; it is their *Sohaga*, Sanscrit *Tincana*, and one of the kinds of *Booruk* of the Arabs. Its nature was first ascertained by Geoffroy in 1732. It is produced by spontaneous evaporation on the shores of some lakes in Thibet, that is, in the same country with Musk and Rhubarb; brought across the Himalayan Passes into India, and imported into this country by the names of *Tincal* and *Crude Borax*. It is also obtained by saturating the Bor′ of Tuscany (p. 40) with Carb. Soda.

Prop.—Crude Borax is in pale greenish pieces, covered with an earthy coating, and feels greasy to the touch. The natives of Thibet are said to cover it with some fatty matter, to prevent its destruction by efflorescence. It is purified by calcining, which destroys the fatty matter, or by washing with an alkaline ley, which converts it into a soap, then dissolving and re-crystallising. It crystallises in irregular hexahedral prisms, often terminated by 2–4 converging planes. Sp. Gr. 1·35. It is colourless, transparent, somewhat shining; taste sweetish, a little styptic, and subalkaline. It has an alkaline reaction on Turmeric. The crystals effloresce slightly in the air, are soluble in 12 parts of cold and 2 of boiling water, insoluble in rect. spirit. When heated, they lose water, swell up into a porous substance called *Borax usta* (*v. calcinata*), and at a red heat run into transparent glass, called *Glass of Borax*, much used as a flux. Another variety, more useful in the arts, contains only 5 Eqs. Aq., and crystallises in octohedra, which are permanent in the air. Borax increases the solubility of Cream of Tartar (p. 98), and converts mucilage of Lichen and of Salep into a thick jelly. Comp. per C., Na O 16·0 Bor′ 35·79 Aq. 47·37 = 100.

Tests.—Not liable to adulteration. Totally soluble in water. Gives a green colour to the flame of Alcohol. Sul′ precipitates scales of Boracic′ from a hot concentrated solution, Sulph. Soda being left in solution. Boracic Acid burns in spirit with a green flame. 191 *gr. of Borax dissolved in* 10. *oz. dist. water are saturated by* 1000 *measures of the volumetric Sol. Oxalic acid.*

Inc.—Acids, Acid Salts, Potash, Chlorides of Calcium and Magnesium.

Action. Uses.—Sub-Astringent, Detergent, Diuretic, Emmenagogue.

Dose.—Gr. v.–ʒß. ʒij. in Aq. f℥vj. as a lotion.

Glycerinum Boracis, B. Glycerine of Borax.

Prep.—Rub *Borax* in powder, ℥j., with *Glycerine*, ℥iv., until dissolved.

Introduced in B. 1867. Applied to Aphthæ, ulcers, and eruptions. Used as an ingredient in cooling lotions.

Mel Boracis, B. Honey of Borax.

Prep.—Mix *Borax* powdered, gr. lxiv., with *Honey* clarified, ℥j.

Action. Uses.—Subastringent, Detergent. Applied to Aphthæ, and to ulcers of the inside of the mouth.

SODÆ SULPHAS, B.

Sulphate of Soda. *Natrum Vitriolatum. Sal Catharticus. Sal Mirabile Glauberi. F.* Sulphate de Soude. *G.* Schwefelsaures Natron.

Sulphate of Soda ($Na\,O,\ S\,O_3 + 10\ Aq. = 161$), or Glauber's Salt, is found effloresced on the soil in some countries, as in India, where it is called *kharee nimuk* or *kharee noon*. It occurs in large masses in the mountains of the Ebro valley, and near Aranjuez in Spain. It exists in sea water, in that of some lakes and mineral springs, also in Glauberite. It is found in the ashes of many plants, and in some animal secretions.

Prop.—Fresh prepared, it is transparent and colourless, without colour, but having a nauseously bitter taste. It crystallises in four and six-sided oblique rhombic prisms, often with dihedral summits. An anhydrous variety crystallises in rhombic octohedra. 3 parts of water at 60° dissolve one of the salt; the solubility increases to 92°, and then diminishes to 215°, at which point the salt is only as soluble as at 87°; boiling water dissolves its own weight; it is only very slightly soluble in Alcohol. In the air the crystals effloresce; if heated, they first melt in their water of crystallisation, then lose half their weight, and fall into a white powder. Heated with Carbon, the salt is converted into Sulphuret of Sodium. The solution is decomposed by salts of Baryta, Lime, and Lead, insoluble Sulphates being precipitated. Comp. Na O 19·75, S′ 24·69, Aq. 55·56 = 100.

Sulphate of Soda is largely prepared by the action of Sul′ on Common Salt (p. 105), and is a residual Salt in several manufacturing processes (pp. 53 and 74). It has been proposed to make it economically by acting on a solution of Common Salt at a temp. of 32° with Sulph. Iron obtained by roasting Pyrites.

Prep.—In the preparation of H Cl, by acting with Sul′ on Chloride of Sodium, Sulph. Soda is produced. But as there is always an excess of acid, it is neutralised by Carbonate of Lime, the Carb′ escaping; some insol. Sulph. Lime is formed, from which the soluble Sulphate of Soda is easily separated.

Tests.—Not liable to adulteration. Exposed to the air, it falls to powder. 100 parts lose 55·5 parts by a strong heat. Totally dissolved by water; very slightly by Alcohol (insol. *Phillips*). It does not alter the colour of Litmus or Turmeric. Nitr. Silver throws down scarcely anything (unless Chlorides be present) from a dilute solution. From the solution in dist. water of 50 grains, Chloride Barium and Hydrochloric′ being added, 72·2 grains of Sulphate of Baryta (to be dried at a red heat) are precipitated. B. The presence of Iron may be detected by Ferrocyanide of Potassium, or by Tincture of Galls, and of Copper by the blue colour produced by Ammonia.

Inc.—Carb. Potash, Chloride Calcium, Barytic Solutions, Acetate and Diacetate of Lead.

Action. Uses.—Purgative. Often called CHELTENHAM SALTS.

Dose.—ʒiv.–℥j. or ℥ij. ʒiij.–ʒiv. of the effloresced or anhydrous salt.

SULPHITE OF SODA ($Na\,O,\ S\,O_2$) is a soluble crystalline salt, which may be made by passing a stream of well-washed $S\,O_2$ gas into a solution of Carb. Soda until saturated, and then evaporating to form crystals. It has been recommended as an alterative and mild purgative. Both this salt and the Bisulphite (which is formed by using an excess of Sulphurous acid) have been used in dyspepsia depending on *Sarcina ventriculi.* When in presence of the acid of the stomach, the sulphite is decomposed, and $S\,O_2$ evolved, which destroys the vegetable organism.

Dose.—As alterative ʒß–ʒj., purgative, ʒj.–℥ß.

HYPOSULPHITE OF SODA ($Na\,O,\ S_2\,O_2$) is a salt largely used by photographers to form the "fixing solution." It is used in the B. P. as a test, and in volumetric analysis. It is a powerful deoxidiser, decolorising solution of Iodine by forming Hydriodic acid. It is prepared by digesting a solution of the Sulphite with Sulphur at a gentle heat for several days. $S\,O_2 + S = S_2\,O_2$. The solution is evaporated at a moderate temperature to form crystals. The addition of acids to its solution decomposes the $S_2\,O_2$ into $S\,O_2$ and S. This salt has been largely used in France in the treatment of skin diseases.

Dose.—Gr. xv.–ʒß.

SODÆ NITRAS, B. Nitrate of Soda. Cubic Nitre. Chili Saltpetre.

($Na\,O,\ N\,O_5$.) Occurs native in large quantities in Chili, and is purified by crystallisation. It is very soluble in water (2 parts), and in many respects resembles Nitrate of Potash. It is distinguished from it by the Tartaric acid test. If pure it is entirely soluble in water, and gives no precipitates with Nit. Silver or Chlor. Barium.

Uses.—Chiefly pharmaceutical. Nitric acid may be prepared from it, and the B. P. uses it in the preparation of Arseniate of Soda.

(SODÆ NITRIS. Nitrite of Soda was employed in the B. P. 1864 in the preparation of Spiritus Ætheris Nitrosi. The salt was made by deflagrating Nitrate of Soda with Charcoal, and was an impure product, containing often only 25 per cent. of Nitrite.)

SODÆ PHOSPHAS, B.

Phosphate of Soda. Rhombic Phosphate of Soda. *Tasteless Purging Salt. Sal Mirabile perlatum.* Triphosphate of Soda and Basic water (Turner), or Common Tribasic Phosphate of Soda. *F.* Phosphate de Soude. *G.* Phosphorsaures Natron.

Phosphoric acid ($P\,O_5$) being tribasic, it is combined in this salt with 2 Eq. of Soda, and 1 of Basic water. The crystals contain besides this 24 Eq. of water of crystallisation. ($2\,Na\,O, P\,O_5, H\,O = 142 + 24$ Aq. $= 358$.) It is used in metallurgy, and was introduced into practice by Dr Pearson about 1800. It was found in Urine by Hellot in 1737, and analysed by Marcgraff in 1745. It is also found in the Serum of the blood, and in other animal secretions; it is obtained from bone-ashes.

Prop.—Phosphate of Soda is colourless, transparent, and of a cool saline taste. It crystallises in large oblique rhombic prisms, each terminating in four converging planes. Sp. Gr. 1·5. Soluble in four times its weight of cold and in twice its weight of boiling water; but not in Alcohol. The crystals effloresce in the air; when heated, they undergo aqueous fusion, and then lose water, and at a red heat melt into a greenish-coloured glass, opaque when cool. Phosphate of Soda has a slight alkaline reaction. Solutions of Acetate of Lead and of Chloride of Barium produce white precipitates (Phosphates). Nitr. Silver throws down a yellow precipitate (Phosphate of Silver), unless the Phosphate has been previously heated to a red heat, and become bibasic Phosphate of Soda; then a white Pyrophosphate of Silver is produced. All these precipitates are soluble in Nit′, and the last also in Ammonia. It is decomposed by the soluble salts of Lime, and also by those of Magnesia. In the latter case, if Ammonia be likewise present, a very insoluble triple compound is formed, the Ammoniaco-Magnesian Phosphate, one of the varieties of urinary gravel. It is not acted on, if moderately diluted, by Ammoniacal Nitrate of Silver; which constitutes a distinction between the actions of the Silver test on this salt and on Arsenic in solution. Phosphate of Soda, according to Professor Graham, consists of 1 Eq. of Phosph′, 1 of basic water, 2 of Soda, and 24 of water of crystallisation, thus constituting a Triphosphate or Tribasic Phosphate of Soda and Water, as stated above. When subjected to a red heat it loses

63 per cent. of its weight, and the basic water being expelled, 1 Eq. of acid remains combined with 2 of Soda, and forms a Bibasic or Pyrophosphate of Soda, the salt which melts into a glass. ($2\ Na\ O,\ P\ O_5$.)

Prep. B.—Place *Bone Ash* in powder ℔ x. in a capacious earthenware or leaden vessel, pour on *Sulphuric acid* ℥lvj., and stir with a glass rod until the whole powder is thoroughly moistened. After twenty-four hours, add gradually and with constant stirring a gallon of *Dist. water;* digest for forty-eight hours, adding *Distilled water* from time to time to replace what has evaporated. Add another gallon of the water, stirring diligently, digest for an hour, filter through calico, and wash what remains on the filter with successive portions of Distilled water, till it has almost ceased to have an acid reaction. Concentrate the filtrate to a gallon, let it rest for twenty-four hours, and filter again. Heat the filtrate to near the boiling point, add ℔xvj. *Carbonate of Soda*, or q. s., previously dissolved in two gallons of the water, till it ceases to form a precipitate and the fluid has acquired a feeble alkaline reaction. Filter through calico, evaporate the clear liquor till a film forms on the surface, and set it aside to crystallise. More crystals will be obtained by evaporating the mother liquor, a little *Carbonate of Soda* being added if necessary to maintain its alkalinity.

Dry the crystals rapidly and without heat on filtering paper placed on porous bricks, and preserve them in stoppered bottles.

By the action of the Sulph. acid on Bone Ash, a Superphosphate of Lime is produced, as explained in the account of the preparation of Phosphorus. Sulphate of Lime is produced at the same time, and is separated by filtration. The heating of the liquid to the boiling point facilitates the subsequent decomposition of the acid Phosphate.

When the Carbonate of Soda is added to the solution of Superphosphate of Lime, Phosphate of Soda is formed, and remains in solution, Carb′ gas escaping, and Sulphos. Lime being precipitated—

$$2\ (Ca\ O,\ 2\ H\ O,\ P\ O_5) + 2\ (Na\ O,\ C\ O_2) = (2\ Na\ O,\ H\ O,\ P\ O_5) + (2\ Ca\ O,\ H\ O,\ P\ O_5) + 2\ C\ O_2 + 2\ H\ O.$$

Tests.—If the precipitate made by Chlor. of Barium is insoluble in Nit′, a Sulph., probably of Soda, is present; if that by Nitr. Silver is so, then a Chloride is present. Carb. Soda is generally used in excess, especially as fine crystals are then more easily obtained; its presence is readily detected by its effervescing with acids.

Inc.—Calcareous and Magnesian Salts; many Metallic Salts, as Acetate of Lead, &c.

Action. Uses.—Mild Saline Cathartic; less unpleasant than many others. Used in the preparation of Phosphate of Iron.

Dose.—℥iv.–ʒvj. A solution in 10 parts of water is employed as a test by the B. P.

PHOSPHITE OF SODA ($Na\ O,\ P\ O_3 + 11\ H\ O$) and HYPOPHOSPHITE OF SODA ($Na\ O,\ P\ O + 2\ H\ O$) are soluble crystalline salts, made by acting on Carbonate of Soda with the Phosphite or Hypophosphite of Lime (q. v.) They have been used in medicine as nervine stimulants, but their efficacy is doubtful. They have been particularly recommended in phthisis and scrofula. *Dose* of the *Phosphite*, gr. xv.–gr. xxx., of the *Hypophosphite*, gr. v.–gr. x. in water or syrup.

SODA TARTARATA, B. Tartarated Soda.

SODÆ ET POTASSÆ TARTRAS. (Sodæ Potassio-Tartras, L.) Tartrate of Soda and Potash. *Soda Tartarizata. Tartarised Soda. Rochelle Salt. F.* Tartrate de Potasse et de Soude. *G.* Weinsaures Natron Kali.

Tartrate of Soda and Potash ($K O, Na O, C_8 H_4 O_{10} + 8 Aq. = 282$) was discovered in 1672 by Seignette, an apothecary of Rochelle. Hence it is called *Sel de Seignette*, also Rochelle Salt. The Colleges differ in naming this salt. It has most generally been ranked as a Soda salt in medical writings.

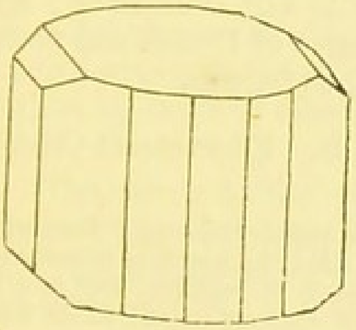

Fig. 17.

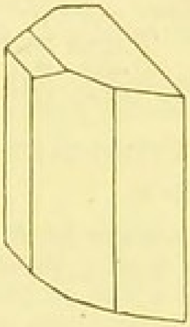

Fig. 18.

Prop.—Colourless and without odour ; of a mild, saline, slightly bitterish taste. Crystals transparent, often very large, in prisms with ten or twelve unequal sides ; usually seen in half-crystals having six unequal sides ; the primitive form is the right rhombic prism. They effloresce in a dry air, and, when heated, melt in their water of crystallisation. The acid next becoming decomposed, Carbonates of Potash and Soda are left with some Charcoal. "Heated with $S O_3$ it blackens, evolving inflammable gases, and the odour of burnt sugar." (B.) This salt is soluble in 5 parts of water at 60°, and in less boiling water. It is readily decomposed by most acids and acidulous salts, except the Bitart. Potash. The acids combine with the Soda, and precipitate Bitart. Potash from a strong solution. It is also decomposed by the Acet. and Diacet. Lead, and by the soluble salts of Lime and of Baryta ; but this is not apparent in a dilute solution. A white precipitate is also thrown down in a strong solution by Nitr. Silver (*p*), which is soluble in an excess of water. This, therefore, like the former, is not perceptible in a dilute solution. Potash may be recognised by its peculiar tests, and when it has been precipitated, the Soda will be revealed by its tests.

Prep.—B. Take of *Acid Tartrate of Potash* ℥xvj., and of *Carbonate of Soda* ℥xij., with *Water* Oiv. Dissolve, neutralise, and evaporate to crystals, in the same way as for Tartrate of potash.

Tartaric acid is bibasic ; in the Bitartrate (or Acid Tartrate) it is combined with 1 Eq. of Potash, and one of water. On adding the Carb. Soda, this water is replaced by an Eq. of Soda, and the $C O_2$

escapes. As both the Carb. Soda and the Bitart. Potash are liable to vary in strength, it is better to add the latter to saturation, though it is preferable to have excess of Soda rather than of acid.

Tests.—Not liable to much adulteration, from being sold in crystals; but both Bitart. Potash and Tart. Lime are sometimes present. It should be entirely and easily soluble in 5 parts of boiling Aq. The solution does not affect Litmus or Turmeric. S', H Cl, and Acetic acid, occasion a crystalline precipitate in a strong solution (Bitart. Potash). "141 *gr. heated to redness till gases cease to be evolved, leave an alkaline residue, which requires for neutralisation* 1000 *measures of the volumetric Sol. Oxalic acid.*" (B.)

Inc.—Acids and Acidulous Salts, Acet. and Diacet. Lead, &c.

Action. Uses.—Mild saline Diuretic and Purgative; Antiphlogistic. Turns in the blood to Carbonates of Potash and Soda.

Dose.—ʒij.–℥ß, or in effervescence, as follows.

SODÆ CITRO-TARTRAS EFFERVESCENS, B. Effervescent Citro-tartrate of Soda.

Prep.—Take of *Bicarbonate of Soda* in powder, ℥xvij.; *Tartaric acid* in powder, ℥viij.; *Citric acid* in powder, ℥vj. Mix the powders thoroughly, place them in a dish or pan of suitable form heated to between 200° and 220°, and when the particles of the powder begin to aggregate, stir them assiduously until they assume a granular form; then, by means of suitable sieves, separate the granules of uniform and most convenient size, and preserve the preparation in well-closed bottles.

Introduced in 1867. A preparation similar to this has long been sold under the misleading name of "Effervescing Citrate of Magnesia." It resembles "Seidlitz Powders," which consist of Bicarb. Soda, Tartarised Soda, and Tartaric acid. In the preparation of the Citro-tartrate the water of crystallisation is partly driven off, and the dryness of the mixture obtained prevents the decomposition of the Bicarb. Soda by the two acids. When thrown into water, effervescence takes place from the escape of $C\,O_2$, and a solution of the Citrate and Tartrate of Soda results. Granular preparations, made as above, effervesce more regularly than ordinary mixed powders, which are apt to cake, and thus require stirring.

Action. Uses.—A mild and agreeable saline purgative. In small doses diuretic, and acts on the system as an Alkali.

Dose.—Gr. lx.–℥¼, with water, drunk while in effervescence.

SODÆ ACETAS, B.

Acetate of Soda. *Terra foliata Tartari crystallizata. Terra foliata Mineralis. F.* Acetate de Soude. *G.* Essigsaures Natron.

The Acetate of Soda ($Na\,O,\ C_4\,H_3\,O_3 + 6\ Aq. = 136$) is stated by Thomson to have been first described by Baron in 1747. It probably exists in many of the plants of which the ashes yield Carbonate of Soda. It is made in large quantities by the manufacturers of Pyroligneous acid, q. v.

Prop.—When pure, a colourless salt, having a pungent rather bitter saline taste. It crystallises in transparent, oblique rhombic prisms, or in striated needles, often seen in foliaceous masses. Sp. Gr. 2·1. Soluble in about 3 parts of water at 60°, and in its own weight of boiling water, and in about 24 parts of Alcohol. Exposed to dry air, it effloresces, losing about 40 per cent. of weight. Heat, cautiously applied, likewise expels its water of crystallisation ; but at a temperature of 600° the salt is decomposed, and at a red heat converted into the Carbonate with some Charcoal. Comp. $Na\,O$ 23·36 + A′ 37·22 + Aq. 39·41 = 99·99.

Prep.—Acetate of Soda is made on a large scale by saturating impure Pyroligneous acid with Chalk or Slaked Lime. The Acetate of Lime which is formed is decomposed by the requisite quantity of Sulphate of Soda. An insoluble Sulphate of Lime is precipitated, and Acetate of Soda remains in solution.

Tests.—Acetate of Soda is not liable to any great adulterations as made at present. It is soluble in water ; slightly so in Alcohol. Sul′ evolves an acetous odour. Heat converts it into Carbonate of Soda.

Inc.—The strong Acids.

Action. Uses.—Diuretic, Cathartic. May be used as Acetate of Potash. It is employed as a test, and in the preparation of Acidum Aceticum Glaciale, B.

Dose.—Diuretic, gr. xx.–ʒij. Purgative, ʒj.–ʒiv.

SODÆ VALERIANAS, B. Valerianate of Soda.

Valerianate of Soda ($Na\,O,\ C_{10}\,H_9\,O_3 = 124$) is used by the B. P. in the preparation of the Valerianate of Zinc. Valerianic′ may be prepared from the essential oil of Valerian (see Valerianaceæ), or from Fousel oil, a compound obtained towards the end of the distillation of Potato-spirit. The latter source is adopted by the B. P.

Prep.—B. Take of *Amylic Alcohol* (Fousel oil), f℥iv. ; *Bichromate of Potash*, ℥ix. ; *Sulphuric acid*, f℥vjß. ; *Solution of Soda*, a sufficiency ; *Distilled water*, Cß. Dilute the sulphuric acid with f℥x. of the water, and dissolve the bichromate of potash in the remainder of the water with the aid of heat. When both liquids are cold, mix them with the fousel oil in a matrass, with occasional brisk agitation, until the temperature of the mixture has fallen to about 90°. Connect the matrass with a condenser, and distil until about half a gallon of liquid has passed over. Saturate the distilled liquid accurately with the solution of Soda, remove any oil which floats on the surface, evaporate till watery vapour ceases to escape, and then raise the heat cautiously so as to liquefy the salt. When the product has cooled and solidified, break it into pieces, and immediately put it into a stoppered bottle.

Fousel oil ($C_{10}\,H_{11}\,O,\ H\,O$) is the Hydrated oxide of an organic radical called Amyle ($C_{10}\,H_{11}$), and has chemically the same relation to Valerianic which Alcohol has to Acetic acid.

Valerianic acid ($C_{10}\,H_9\,O_3,\ H\,O$) is derived from Fousel oil by the abstraction of 2 Eq. of Hydrogen, and the addition of 2 of Oxygen. Bichromate of Potash and Sulph. acid, being distilled together with the oil, supply it with oxygen. Thus,—

$$K\,O,\ 2\,Cr\,O_3 + 4\,S\,O_3 = K\,O,\ S\,O_3 + Cr_2\,O_3,\ 3\,S\,O_3 + 3\,O.$$

Oxygen being thus furnished in a nascent state, acts upon Fousel oil, forming Valerianic′ and water—

$$C_{10} H_{11} O, H O + 4 O = C_{10} H_9 O_3, H O + 2 Aq.$$

The acid is distilled over, neutralised with solution of Caustic Soda, and the resulting solution evaporated to dryness. The concrete Salt is broken up into fragments, and kept from the air.

Prop.—It is, as thus made, a white amorphous compound with a strong odour and taste of Valerian, increased by adding $S O_3$. It is deliquescent, and very soluble in water and rectified spirit.

Use.—Antispasmodic. Employed in the preparation of the other Valerianates. Forms for preparing the Valerianates of Iron and Quina were given by the D. C.

Dose.—Gr. i.–gr. v., in Hysteria.

SODÆ ARSENIAS, B. (See Compounds of Arsenic.)

LITHIUM.

LITHIUM ($L = 7$) is the third of the alkaline metals, and resembles Potassium and Sodium in many of its properties. It was discovered by Arfwedson in 1817, and occurs in the minerals called Petalite and Lepidolite, obtained from Sweden, and in many mineral waters.

LITHIA ($L O = 15$) is a white caustic substance, less soluble in water than Potassa or Soda, not deliquescent, but absorbing $C O_2$ from the air. It requires a larger proportion of acid to neutralise it than the other alkalies. It does not precipitate the Bichloride of Platinum, and thus differs from Potash. Its salts tinge the flame of the blow-pipe red, and thus differ from those of Soda.

LITHIÆ CARBONAS, B. Carbonate of Lithia.

This salt ($L O, C O_2 = 37$) occurs in crystalline grains, or a white powder. It has an alkaline reaction, but requires 100 parts of water at 60° for solution. It is thus far more insoluble than the carbonates of Potash and Soda. It is insoluble in alcohol.

Prep.—Sulphate of Lithia is obtained by acting on *Petalite* or *Lepidolite*, with strong $S O_3$, heating to redness, and dissolving the residue. From a strong solution of the Sulphate the Carbonate is precipitated by adding Carb. Ammonia. It may be crystallised by solution in hot water, and cooling.

This salt dissolves with effervescence in $H Cl$; the solution evaporated yields Chloride of Lithium, which, redissolved in water, is precipitated by Phosphate of Soda. (Lithia is thus distinguished from the other alkalies. The slight solubility of its carbonate separates it from the alkaline earths.) The salts of Lithia yield no precipitate with solution of Oxalate of Ammonia, or solution of Lime. "Ten gr. of the Carbonate neutralised with $S O_3$, and heated to redness, leave 14·86 gr. of dry Sulphate of Lithia." (B.)

Action. Uses.—It may be given in all cases when an alkali is required, and has an advantage over other alkaline carbonates in being less caustic. This, however, is more than counterbalanced by the fact of the insolubility of its phosphate, which renders it difficult for a salt of lithia to circulate in the blood to remote parts of the system. On account of the urate of lithia being more soluble than the other alkaline urates, its salts have been recommended in gouty cases, and to combat the tendency to lithic deposit in the urine.

Dose.—Gr. x.–gr. xxx. It may be given in carbonated water, in which it is more soluble than in simple water. Uric acid calculi have been dissolved by the repeated injection into the bladder of a warm solution of Carbonate of Lithia.

LIQUOR LITHIÆ EFFERVESCENS, B. Effervescing Solution of Lithia. Lithia water.

Prep.—B. Take of *Carbonate of Lithia*, gr. x., *Water*, Oj. Mix in a suitable apparatus, and pass into it as much pure washed Carbonic acid gas, obtained by the action of Sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.

Introduced in 1867. It is probably a solution of Bicarbonate of Lithia, which loses half its CO_2 when exposed to the air, and effervesces strongly when the containing vessel is opened, Carb. acid escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste. Half a pint of it, evaporated to dryness, leaves 5 grains of carbonate of lithia. It is used in lithic cases, as the Carbonate.

Dose.—f℥v.–f℥x.

LITHIÆ CITRAS, B. Citrate of Lithia.

($3\,LO, C_{12}H_5O_{11}$.) It is a neutral or tribasic salt, like the other alkaline citrates. It occurs as a deliquescent white powder, soluble in water, or may be obtained in large crystals. Like the citrates generally, it blackens and evolves inflammable gases when heated to redness. Carbonate of Lithia remains, which, acted on by HCl, dissolves to form the chloride. If this be dissolved in rectified spirit, the tincture will burn with a crimson flame, which is characteristic of lithia. "Gr. xx. of the citrate, burned at a low red heat, leave 10·6 gr. of white residue." (B.)

Prep.—B. Dissolve *Citric acid* in crystals gr. xc., in warm *Dist water* ℥j., and add *Carbonate of Lithia* gr. l. in successive portions, applying heat until effervescence ceases, and a perfect solution is obtained. Evaporate by a steam or sand bath till water ceases to escape, and the residue is converted into a viscid liquid. This should be dried in an oven or air chamber at the temperature of about 240°, then rapidly pulverised, and enclosed in a stoppered bottle.

The Cit. Acid and Carbonate are used in the exact equivalent proportions. The CO_2 is expelled, and the soluble Citrate, which does not easily crystallise, is obtained by drying at a low heat, and then kept from the air to prevent it from deliquescing.

Action. Uses.—More convenient for use than the carbonate, on account of its solubility and pleasant saline taste. It is converted into a carbonate in the system by oxidation of the Citric acid. (*See* Carb. Lithia.)

Dose.—Gr. x.–gr. xxx.

ALKALINE-EARTHY METALS.

BARIUM.

Baryta was discovered by Gahn and Scheele about 1774, and obtained its name from *βαρυς*, *heavy*. Sir H. Davy discovered that it was the Oxide of a Metal, which he named Barium.

BARIUM ($Ba = 68{\cdot}5$) is a brilliant silver-white metal; heavy; Sp. Gr. above 2; when heated, burning with a red light in the air, and decomposing water, combining in both cases with Oxygen, and forming an Oxide of Barium, or the earth Baryta.

BARYTA. Oxide of Barium.

Baryta or Barytes ($Ba\,O = 76{\cdot}5$) is a porous substance, of a greyish colour, devoid of odour, with a powerful caustic taste, alkaline reaction, corroding animal substances. Sp. Gr. 4. It combines eagerly with water, evolves heat, and becomes a Hydrate, which is not decomposed at a red heat; is with difficulty fused; insoluble in Alcohol, but soluble in 20 parts of cold and 3 of boiling water, forming Barytic water.

Tests.—It may be detected by its alkaline reaction; and by the heavy white precipitates which it forms with S′ or the soluble Sulphates, and which are insoluble in water and Nitric acid.

Action. Uses.—Baryta is an acrid caustic, and will act as a poison on the system.

BARYTÆ CARBONAS. Carbonate of Baryta.

Carbonate of Baryta ($Ba\,O,\ C\,O_2 = 98{\cdot}5$) was described in 1784 by Dr Withering, and named Witherite by Werner; it is rather common in Lancashire. It may be prepared in the form of a powder by decomposing Chlor. Barium by an alkaline Carbonate. In its native state it occurs massive with a fibrous structure, or imperfectly crystallised in a globular form, or in hexagonal prisms, or in pyramids.

Prop.—It is hard, of a white or greyish colour, without odour or taste, with a vitreous lustre, and subtransparent. Sp. Gr. 4·29 to 4·3; nearly insoluble in water, unless there is excess of Carb′. The native Carbonate is not decomposed by any heat, the artificial at a white heat in contact with carbonaceous matter. Comp. $Ba\ 77{\cdot}7 + C'\ 22{\cdot}3 = 100$.

Action. Uses.—Carbonate of Baryta, though insoluble and tasteless, yet acts with considerable activity when introduced into the stomach of animals, probably from meeting there with acid, by which it is converted into a soluble salt. Officinal for the purpose of making the Chloride of Barium.

BARYTÆ SULPHAS. Sulphate of Baryta.

Sulphate of Baryta ($Ba\,O,\ S\,O_3 = 116{\cdot}5$), or Heavy Spar, is more abundant as a mineral than the Carbonate. The finest specimens have been obtained from Dufton in Cumberland: the author found it on the Himalayas, near the convalescent depot at Landour. (*See* Illustr. Himal. Bot. p. xxxiii.)

Prop.—Heavy Spar may be found massive or crystallised, of a foliaceous or lamellar structure; white-grey, or with a reddish hue; often translucent; heavy; Sp. Gr. 4·41 to 4·67; without odour or taste; insoluble in water. Its crystals are often bevelled tables or flat prisms of six sides, and may be divided into right rhombic prisms. This salt is formed whenever Baryta meets with S′, in whatever state of combination either the earth or the acid may previously have been; and the Sulphate of Baryta being insoluble in Nit′, this is employed to test it. Hence this earth and its soluble salts are excellent tests for S′ and the Sulphates. It is doubly refractive, decrepitates briskly before the blowpipe, and is with difficulty fused, but eventually melts into a hard white enamel, which is not affected by acids. Sulphate of Baryta, when heated with carbonaceous matter, has its acid decomposed, and Sulphuret of Barium is formed. From this various salts may be formed by operating with different acids, or it may be converted into Carbonate of Baryta by heating it to a red heat with three parts of Carbonate of Potash. Comp. $BaO\ 66 + S'\ 34 = 100$.

Action. Uses.—Inert. Employed for making other salts, being cheap and usually pure.

Barii Chloridum. (B. Appendix.) Chloride of Barium.

Chloride of Barium ($BaCl + 2\,Aq. = 122$), at one time called *Terra ponderosa Salita* and *Barytes Salita*, was discovered by Scheele in 1775. It is prepared from either the Barytic Carbonate or Sulphate, the latter being first heated with charcoal and the resulting Sulphuret acted on by H Cl.

Prop.—By evaporation of its solution it may be obtained in rhombic plates, or flat or tabular quadrangular crystals with bevelled edges. Sp. Gr. 2·82. These, like the solution, are colourless and transparent, of an acrid and bitter, nauseous, disagreeable taste; efflorescent in the air when it is very dry; but in ordinary states, they are permanent. They produce no action on vegetable colours. Of these crystals 100 parts of water at 60° F. dissolve about 40 parts; but at the boiling point, 222° of a saturated solution, 78 parts are dissolved. They are slightly soluble in rectified Spirit, and in 400 parts of anhydrous Alcohol, which will then burn with a greenish-yellow flame. (Strontian salts burn red.) At a moderate heat the crystals decrepitate and lose their water of crystallisation.

Tests.—Sul′ and the Sulphates throw down the insoluble Sulphate of Baryta from the solution; it is also precipitated by the soluble Phosphates, Carbonates, and Tartrates. Nitr. Silver gives a white precipitate (Chlor. Silver), which is soluble in Am., but insol. in Nit′. Impurities are less apt to occur when this salt is made with the Sulphate than when made with the Carbonate. Apply the same tests.

Action. Uses.—Acrid, Irritant, Stimulant, Deobstruent. A solution in ten parts of dist. water is employed as a test to detect S′ and Sulphates. The Nitrate of Baryta may be used for the same purpose.

CALCIUM.

Lime, in its caustic state, was early known, being employed for making building mortar by the Egyptians, Hindoos, &c. Davy proved that it is an Oxide of a metal, which has been called Calcium, from Calx. Calcium (Ca = 20) is white, brilliant, decomposes water, and, when slightly heated, burns in the air, being converted into the Oxide of Calcium, or Lime.

CALX, B.

Oxide of Calcium. Quicklime. Caustic or pure Lime.
F. Chaux. *G.* Kalk.

Prop.—Lime (Ca O = 28), in its pure form, is a greyish-white earthy-looking mass, moderately hard, brittle; Sp. Gr. 2·3–3·08; having an acrid alkaline taste; corroding animal substances. When fresh burnt, it absorbs both moisture and Carb′ from the air; it will abstract water from most bodies, and hence is often employed as a drying substance. Comp. Ca 71·42 + O 28·58 = 100.

Commercial Lime, though easily procured, is seldom pure enough for medical use. It is made by burning the Carbonates. White Carrara Marble, Calcareous Spar, Chalk Shells, all yield good Lime. The heat being sufficiently great, the Carb′ is expelled, and about 56 per cent. of Lime left in a caustic state, and tolerably pure; but, if shells have been employed, mixed with a little Phosphate of Lime and Oxide of Iron. It must be kept well closed up.

Tests.—Two-thirds of its weight of water being added, Lime cracks, falls to a white bulky powder, with a great development of heat, and is slaked, forming Hydrate of Lime. This may then be tested for impurities.

CALCIS HYDRAS, B. Hydrate of Lime, or Slaked Lime.

This (Ca O + HO = 37) is formed whenever water is sprinkled over caustic Lime: it is immediately absorbed with a hissing noise, the Lime splitting and crumbling into a dry, white, powdery Hydrate.

Prep.—B. Place *Lime* recently burned ℔ij. in a metal pot, pour *Dist. water* Oj. upon it, and when vapour ceases to be disengaged, cover the pot with its lid, and set it aside to cool. When its temperature has fallen to that of the atmosphere, remove its contents, pass the powder through an iron-wire sieve, and put it into a wide-mouthed bottle, which should be accurately closed by a well-fitted cork.

Slaked Lime should be recently prepared.

Lime is capable of thus taking up about 31·0 of its weight of water, and at the same time disengaging so much heat, as to inflame wood.

It loses its water by the action of heat; but the Lime by itself is very infusible, though powerful as a flux for many earths and Oxides. When heated in the Oxyhydrogen flame, it is intensely luminous, as in the Drummond's light. Acids combine with Lime, some forming very soluble salts, as H Cl, Ac′; while Ox′ and Phos′ form a nearly insoluble Oxalate and Phosphate. Its presence is readily detected in any solution by the milkiness produced by passing Carb′ gas through it, also by alkaline Carbonates and alkaline Sulphates, or by the addition of Ox′ or Oxalate of Ammonia. The Oxalate of Lime will be precipitated from a very dilute solution. Salts of Lime are not precipitated by a saturated solution of Sulphate of Lime, which distinguishes them from those of Baryta and Strontian. The Sulphate is slightly soluble. S′ does not form a precipitate in a dilute solution. Salts of Lime tinge the flame of Alcohol orange. This hydrate is soluble in water, forming Lime water. If exposed to the air it absorbs CO_2, and becomes chalk.

Tests.—Agitated with dist. water, gives a clear solution having an alkaline reaction, and yielding a white precipitate with Oxalate of Ammonia. Soluble without effervescence in HCl. The solution does not precipitate with Ammonia—proving that neither Alumina nor Magnesia are present, nor Oxide of Iron, nor Silica. This solution of the Chloride is not precipitated by Saccharated solution of Lime (B), showing absence of Magnesia and earths.

Action. Uses.—Used as a Masticatory in India with Betel or Pan. Caustic, Disinfectant.

LIQUOR CALCIS, B. Lime Water.

Prep.—B. Take of *Slaked Lime* ℥ij., *Aq. dest. Cong.* j. (The lime is put into a bottle with the water, and then well shaken for two or three minutes. Close the vessel and set aside, that the undissolved Lime may subside; pour off the clear liquor, or decant with a syphon, when it is required. It may be replaced with fresh water, agitating briskly as before, that a fresh supply may be ready.)

A simple solution of Lime in water; requiring to be kept in stoppered bottles, which are constantly filled, as it attracts C′ from the air, which by uniting with the Lime, forms a thin film of Carb. Lime at the surface; this afterwards precipitates in the form of white layers, but its place will be supplied by the undissolved Lime left in the bottle. "Should be kept in a green glass bottle, with a tightly ground stopper." (B.) Dalton ascertained that, contrary to the analogy of most bodies, *cold* water dissolved more of Lime than hot water; that is, water at 60°, $\frac{1}{778}$, and at 212°, only $\frac{1}{1270}$. Mr R. Phillips ascertained that water near the freezing point took up about $\frac{1}{7}$ more than water at 60°, and nearly double that of boiling water.

A pint of water at 32° dissolves 13·25 grains of Lime.
" " 60° " 11·6 "
" " 212° " 6·7 "

Tests.—Lime water is clear and transparent, without odour, but having a disagreeable alkaline taste; changes vegetable blues to green, and forms an imperfect soap with oils; when evaporated under the vacuum of an air-pump, imperfect six-sided crystals may be obtained of the Hydrate of Lime. A precipitate of the Carbonate may be formed by breathing into the solution through a glass tube.

Ten oz. of Lime water require for neutralisation at least 200 *measures of the volumetric Sol. Oxalic acid.* (B.)

Inc.—Acids and Acidulous Salts, Alkaline Carbonates, Ammoniacal and Metallic Salts, Borates, and astringent Vegetable Infusions.

Pharm. Prep.—Lime water is used to make Black and Yellow wash.

Action and Uses of Lime and its Salts.—Lime, applied externally, is slightly caustic. It is combined with oil to form a liniment, which is used as an application to burns. Lime water has been used internally as an antacid in Dyspepsia, Diarrhœa, and Lithic disorders. Lime may be also given in the form of the saccharated solution. It forms the basis of a popular nostrum for Stone in the bladder. It is less corrosive than the true Alkalies.

The Carbonate, or Chalk, is also an admirable antacid. It is much used in Diarrhœa, acting as a desiccant or absorbent, and neutralising acrid matters in the intestines. For this purpose it is generally combined with astringents or aromatics.

Dose.—f℥ij.–f℥viij. of Lime water three or four times a-day.

Liquor Calcis Saccharatus, B. Saccharated Solution of Lime.

Lime is far more soluble in a solution of sugar than in pure water. It forms with the sugar a distinct compound or salt, in which the sugar acts the part of an acid. This solution, introduced in the B. P., furnishes an elegant form for the administration of Lime internally. It contains nearly 13 times as much Lime as the Liquor Calcis.

Prep.—B. Mix *Slaked Lime* ℥j., and *Refined Sugar* in powder ℥ij., by trituration in a mortar. Transfer the mixture to a bottle containing *Dist. water* Oj., and having closed this with a cork shake it occasionally for a few hours. Finally, separate the clear solution with a siphon, and keep it in a stoppered bottle.

The Sp. Gr. is 1·052. Each ounce contains 7·11 grains of Lime. ℥j. = 254 *measures volumetric Sol. Oxalic acid.* (B.) A much stronger solution may be easily obtained.

Action. Uses.—We obtain in this solution the alkaline action of Lime in a convenient form. It may be given in acid dyspepsia, in diarrhœa, for gout, rheumatism, gravel, stone.

Dose.—ʒj.–ʒij., diluted with water.

Linimentum Calcis, B.

Prep.—Agitate briskly together equal parts of *Lime Water* and *Olive Oil. Linseed Oil* may be used.

Both the oils are composed of Oleic and Margaric acids and Glycerine; when mixed with Lime water, an Oleate and Margarate of Lime (Calcareous Soap) are formed. It has long been employed as an application to burns and scalds, and employed for this purpose at the Carron Works,—hence often called Carron oil. Turpentine is sometimes added with advantage. Dr Christison described it as a Lime Soap with an excess of Linseed Oil; for when allowed to rest, the mixture separates into a white soap and a supernatant clear oil.

CALCIS CARBONAS.

F. Carbonate de Chaux. Craie. *G.* Kohlensaurer Kalk.

The Carbonate of Lime ($CaO,\ CO_2=50$) is one of the most widely diffused of minerals, and must have been one of those most anciently employed in the arts, and likewise in medicine. Found in a great variety of forms; forming mountain masses, either crystalline, as Marble and Calc Spar, or compact, as Limestone; in both stratified and unstratified rocks, and as Chalk in great beds, as the newest of the secondary strata. It is also extensively diffused in particles throughout the soil, which by segregation become united into roundish or botryoidal masses, or it may become dissolved by water (when holding in solution Carb. acid), and is found in most springs, from which it is again deposited in a stalactical form. It is found in the ashes of most plants, from the vegetable acids with which it was combined being converted into the Carbonic′ during the process of incineration. Carbonate of Lime forms a constituent of the bones of Vertebrata, and a large part of the shells of testaceous Mollusca, of Crustacea, and of Corals. Hence Oyster-shells, Crab's-claws, Crab's-eyes, as they are called, and Corals, have all been employed in medicine, as formerly the *lapis judaicus*, which is the spine of a fossil echinus. All consist of Carbonate of Lime, with some animal matter intimately intermixed, and sometimes a little Phosphate of Lime. Carb. Lime is found crystallised in a variety of forms, but the primitive form is an obtuse rhomboid, and that of Arragonite a rectangular prism. Many varieties are transparent, and remarkable for doubly refracting the rays of light, especially Iceland Spar. It has been artificially crystallised by Professor Daniell in acute rhombic crystals, which contained 5 per cent. of water. It is very sparingly soluble, 1 part requiring 1600 of water. But if an excess of Carb′ be present, it is readily dissolved, and is hence found in many mineral waters, from which it is again precipitated on the escape of the C′. The solution reddens Litmus paper, but changes the yellow colour of Turmeric paper to brown (*p*). Heated in the air, Carb. Lime loses 44 per cent. of C′, Lime being left; but if heated in close and strong vessels, no change takes place, and, on cooling, artificial Marble is produced, as was done by Sir J. Hall. Bucholz fused it even without compression, in parts to which the access of air was prevented. Carb. Lime is readily decomposed by the acids with strong effervescence, forming soluble salts with NO_5 and HCl, and insoluble ones with SO_3. It may be formed artificially by adding Carb′ to Lime water, or by decomposing any soluble salt of Lime (or the Chlor. Calcium) with the Carbonates of the alkalies. Comp. $CaO\ 56 + CO_2\ 44 = 100$.

MARMOR ALBUM, B. Calcis Carbonis Dura. White Marble.

Marble is officinal for yielding Carb′ gas (p. 60) by the action of stronger acids. It has a glimmering appearance, from the lamellæ of minute crystals intersecting each other in every direction. Pure white Marble is intended ; that of Carrara, commonly called Statuary Marble, is the purest variety.

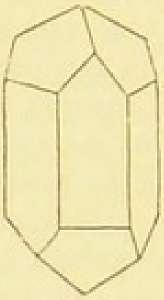

Fig. 19.

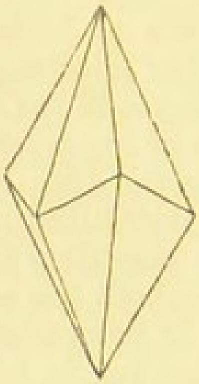

Fig. 20.

Tests.—Marble should dissolve with effervescence in dilute HCl, without residue, proving the absence of Silica and some other impurities. In this solution, Ammonia ought (even after boiling) to cause no precipitate, if neither Magnesia (a constituent of some Lime-stones), nor Alumina, nor Oxide of Iron (the most common impurities), are present. Neither ought it to be decomposed by a solution of Sulphate of Lime in water ; if any precipitate appears, it must be Sulphate of Baryta or of Strontian.

CRETA, B. Calcis Carbonas Friabilis. Chalk.

Chalk is well known as an extensive secondary formation, of a dull white earthy appearance ; tasteless, but adhering to the tongue ; usually friable, sometimes hard ; Sp. Gr. 2·3 ; but either variety may be employed, though the softer is usually preferred for medical use. Its chemical characters are the same as those of Marble. In the arts it is commonly known by the name of *Whiting*, which is Chalk ground in a mill, and the grosser impurities separated by sinking in water, while the pure Chalk, being suspended, is allowed to settle, and made into small loaves. For medical use, it is similarly but more carefully prepared by the process of levigation, and in drying is made up into small conical masses.

CRETA PRÆPARATA, B. Prepared Chalk.

Prep.—B. (1864). Reduce *Chalk* to powder, and having rubbed this in a mortar with as much *water* as will give it the consistence of cream, fill the mortar with more *water*, and stir well, giving the whole a circular motion. Allow the mixture to stand for fifteen seconds, and then decant the milky liquid into a large vessel. Rub what remains in the mortar, adding as much water as was previously used, and, after allowing it to settle for fifteen seconds, again decant, and let this process be repeated several times, using, if necessary, additional Chalk. Transfer the fine sediment which subsides from the decanted liquids to a filter, and dry it at a temperature of 212°.

All soluble matters being removed by this washing, the result should be nearly pure Carbonate of Lime. It is usually dried in small masses of a conical form; these break up easily into a white amorphous powder; with H Cl it dissolves with effervescence, leaving scarcely any residue. The solution supersaturated with Ammonia gives a copious white precipitate with Oxalate Ammonia. The solution of the Chloride gives but a scanty precipitate with the saccharated solution of Lime.

Inc.—Acids and Acidulous Salts, as other Carbonates.

Action. Uses.—Antacid, Absorbent, Desiccant; from allaying irritation, apparently Astringent. It is given in diarrhœa. If long used, care must be taken that it does not accumulate in the intestines.

Dose.—Gr. x.–ʒj.; but usually given in some of the following preparations.

Pharm. Prep.—Hydrargyrum cum Cretâ. Mistura Cretæ. Pulvis Cretæ Aromaticus. Pulv. Cr. Arom. c. Opio.

CALCIS CARBONAS PRÆCIPITATA, B. Precipitated Carbonate of Lime.

This is still more finely divided than the above, and slightly crystalline. It is prepared by precipitating a solution of Chloride of Calcium with a solution of the Carbonate of Soda in boiling water.

Pharm. Prep.—Trochisci Bismuthi.

MISTURA CRETÆ, B. Chalk Mixture.

Prep.—B. Triturate *Prepared Chalk* ℥¼, and powd. *Gum Arabic* ℥¼, with *Cinnamon water* ℥vijß., and mix with *Syrup* ℥ß.

Action. Uses.—Antacid, Demulcent. Much employed in Diarrhœas arising from acidity.

Dose.—f℥ß.–f℥ij. every three or four hours.

[PULVIS CRETÆ COMPOSITUS, L. Compound Powder of Chalk.

Prep.—L. Reduce separately to fine powder *Prepared Chalk*, ℔ß.; *Cinnamon*, ℥iv.; *Tormentil root* and *Gum Arabic*, āā ℥iij.; and *Long Pepper*, ℥ß. Mix well.

Action. Uses.—Antacid, Stimulant, and Astringent. In Diarrhœas of low states of the constitution. Omitted in B. P.

Dose.—Gr. v.–gr. xx.]

PULVIS CRETÆ AROMATICUS, B. Confectio Aromatica, L. Aromatic Confection.

Prep.—B. Mix thoroughly *Prepared Chalk* ℥xj. with powdered *Cinnamon Bark*, ℥iv.; *Nutmeg* and *Saffron*, each ℥iij.; *Cloves*, ℥iß; *Cardamom Seeds*, ℥j.; and *Refined Sugar*, ℥xxv. Pass through a sieve, rub lightly in a mortar, and keep in a stoppered bottle.

Action. Uses.—Antacid and Cordial. Useful in Diarrhœas, and an excellent addition to Rhubarb and Magnesia, and such powders, for children.

Dose.—Gr. v. or gr. x.–ʒj.

PULVIS CRETÆ AROMATICUS CUM OPIO, B. Pulvis Cretæ Opiatus.

1 grain of Opium in 40 grains of the Aromatic Chalk Powder, B. *See* OPIUM.

CALX CHLORATA, B.

Calx Chlorinata, L. Chlorinated Lime. Hypochlorite of Lime. Chloride of Lime. *Oxymuriate of Lime.* Bleaching Powder. *F.* Chlorure de Chaux. *G.* Chlor Kalk.

This substance was first prepared by Messrs Tennant and Mackintosh in 1798. Slaked Lime is made to take up as much Chlorine Gas as it will absorb. The exact nature of the compound not having been satisfactorily determined, the present name has been assigned to it, though it is very commonly called Chloride of Lime, or Bleaching Powder.

Prop.—Chlorinated Lime is a dry pulverulent substance, of a greyish colour, with a hot, penetrating, bitter taste, a weak odour of Chlorine, more perceptible when the powder is shaken. When well prepared, it is very soluble in water ; but commonly a considerable portion (of Lime) remains undissolved. In the atmosphere the Carb′, or any of the other acids, sets free the Chlorine (or Hypochlorous acid), and a Carbonate of Lime is formed, with some Chloride of Calcium, which causes deliquescence. Heat also expels Chlorine and Oxygen. The strongest solution has a density of 1·040. (Ure.) It is of a pale yellow colour, has a slight smell, which some say is the smell of Chlorine, while others (as Pereira) attribute it to Hypochlorous acid. The solution is remarkable for its bleaching and disinfecting properties. The addition of a little acid increases its activity for such purposes.

The composition of this substance cannot be regarded as quite determined. It seems to vary somewhat. Some chemists, as Ure and Thomson, regard it as containing really a compound of Chlorine with Lime. ($CaO, Cl.$) But this view is opposed to chemical analogy, and does not gain ground. The explanation adopted both by Phillips and Pereira of this compound (as well as of Chlorinated Soda) seems the more reasonable of the two. These, as well as Balard and Gay-Lussac, consider it to be a compound of Hypochlorite of Lime with Chloride of Calcium (1 Eq. of each). It also contains generally an excess of Lime, but that is not essential to its constitution. In preparing Soda Chlorinata, 4 Eq. of Carb. Soda and 2 of Chlorine are employed. 2 Eq. of Bicarb. Soda, 1 of Hypochlorite, and 1 of Chlor. Sodium, result. (*Vide* Soda Chlorinata.) But here, instead of Carb. Lime, 2 Eq. only of pure Lime seem to be required, and 2 of Chlorine gas. 1 of Hypochlorite Lime and 1 of Chlor. Calcium are formed, but no Bicarbonate. (*Vide infrà.*) Thus :—

$$\text{Soda Chlorinata} = NaO,\ ClO + NaCl + 2\ (NaO,\ 2\ CO_2).$$

$$\text{Calx Chlorinata} = CaO,\ ClO + CaCl.$$

The two preparations are similar, but not alike.

Chloride of Lime is easily obtained, being largely prepared as a Bleaching Powder. Slaked Lime is spread out on a pile of wooden trays in a chamber built of sandstone (the joints being secured by a cement of Pitch, Resin, and dry Gypsum), into which the Chlorine is transmitted until the Lime is saturated. A larger quantity of Chlorine is absorbed when about 15 per cent. of water is previously added to the Lime, and the Lime is occasionally raked up.

Adopting the above explanation, we must suppose that the Lime gives part of its Oxygen to the Chlorine; by which some Hypochlorous acid is produced, and Hypochlorite of Lime and Chloride of Calcium formed—

$$2\ \mathrm{Ca\,O} + 2\ \mathrm{Cl} = \mathrm{Ca\,O,\ Cl\,O} + \mathrm{Ca\,Cl}.$$

But there is very commonly an excess of Lime, as stated in the B. P., and this is more insoluble than the rest. In 100 parts of a commercial specimen of Chloride of Lime, Fresenius found 26·7 of Hypochlorite, 25·5 Chloride of Calcium, 23 Lime, and 24·8 Water.

Tests.—Dissolves in dilute H Cl, emitting Chlorine. Greyish-white, dry; 50 grs. are nearly soluble in Aq. f℥ij., forming a solution of the density 1·027; this, treated with an excess of Ox′, gives off Chlorine, and deposits a copious precipitate of Oxalate of Lime. Dr C. remarks that probably the simplest criterion of quality is the amount of Chlorine gas evolved by a strong acid, as originally proposed by Dr Ure. (Chlorine gas is evolved with any strong acid. SO_3 being added, for example, it sets free Hypochlorous′ from the Hypochlorite, and H Cl from the Chloride Calcium. These acids (Cl O and H Cl) react on each other, H unites with O to form water, and 2 Cl are set free).

The B. P. gives a quantitative test. *Gr.* x. *with gr.* xxx. *Iod. Potassium in* ℥iv. *water, acidulated with* ʒij. H Cl *give a reddish solution (containing Iodine), decolorised by* 850 *measures volumetric sol. Hyposulphite Soda.*

Action. Uses.—Disinfectant, Antiseptic; in solution as a lotion and gargle. Internally, as Chlorinated Soda.

Dose.—Internally, Gr. j.–gr. v. Used in Tooth-powders, Lozenges, or Ointment, ʒj. with ℥j. of Lard.

LIQUOR CALCIS CHLORATÆ, B. Solution of Chlorinated Lime.

Prep.—B. Mix well *Dist. water* Cj. and *Chlorinated Lime* ℔j. by trituration in a large mortar, and, having transferred the mixture to a stoppered bottle, let it be well shaken several times for the space of three hours. Pour out now the contents of the bottle on a calico filter, and let the solution which passes through be preserved in a stoppered bottle.

The proportions used are one part to ten of water. The free lime remains partly undissolved. The Sp. Gr. of the solution should be 1·035. One drachm corresponds to 5 or 6 gr. of Chloride of Lime. This solution is used like the solution of Chlorinated Soda, as a disnfectant, a wash for putrid sores, a gargle for malignant sore hroats, &c.

CALCI CHLORIDUM, B.

Chloride of Calcium. Hydrochlorate or Muriate of Lime. *F.* Chlorure de Calcium. Hydrochlorate de Chaux. *G.* Salzaurer Kalk.

This salt, often called Muriate of Lime, was known, according to Dulk, as quoted by Dr Pereira, in the 15th century, and called *Sal Ammoniacum fixum*, being obtained by the decomposition of Sal Ammoniac by Lime. It is found in nature in Sea water, and in many springs and mineral waters, sometimes associated with Nitrate of Potash, but usually with Chloride of Sodium and Chloride of Magnesium. It may be readily obtained as a residuum in making several of the preparations of Ammonia, as the Liquor, Spirit, and Carb., or in obtaining C′ by the action of H Cl on Marble.

Prop.—Chloride of Calcium ($Ca\,Cl = 55{\cdot}5$) is known in two forms. The first is the Anhydrous Chloride, which is hard, greyish-coloured, and semi-translucent. Being without water, it contains nearly twice as much Chlor. Calcium as the crystallised salt. It may be fused at a red heat, and becomes phosphorescent. It is very deliquescent, as is also the crystallised salt, passing readily into the liquid state, forming what used to be called *Oleum Calcis.* It is frequently employed to absorb moisture from gases, also to attract moisture to substances with which it may be mixed, as the soil. It is very soluble in rectified spirit, also in water. When in solution its reactions are the same as if it were a Hydrochlorate of Lime, which indeed it may be.

The second, or crystallised variety, contains 6 Eq. of Aq. ($Ca\,Cl + 6\,Aq.$) It is colourless and without smell, of an acrid and bitter taste ; in striated hexagonal prisms terminated by very acute points. Water even at 32° dissolves more than its own weight, and at 60° above three or four times its weight of this salt. When heated, these crystals undergo watery fusion. Dissolved in water, they produce great cold ; and hence are frequently employed as an ingredient in cold or freezing mixtures. The Chloride is used for concentrating Alcohol, which it does by its great affinity for water.

Prep.—B. It may be formed by neutralising Hydrochloric acid with Carbonate of Lime, adding a little solution of Chlorinated Lime and slaked Lime to the solution, filtering, evaporating until it becomes solid, and finally drying the salt at about 400°.

The Carb. Lime (Oxide of Calcium) is decomposed, the C′ being expelled in the state of gas ; the Chlorine of the H Cl combines with the Calcium, and forms Chloride of Calcium ; and the Hydrogen of the acid with the Oxygen of the Lime forms water. In the subsequent part of the process the water of crystallisation is expelled.

Tests.—The presence of Calcium and of Chlorine will be revealed by their respective tests. Chloride of Calcium should be free from colour, slightly translucent, hard and friable, totally soluble in water : the solution gives no precipitate on the addition of Ammonia (showing the absence of Magnesia), or Lime, or Chlor. Barium (Sulphates), nor, when diluted with much water, with Ferrocyanide of Potassium (showing that it is not contaminated with Iron). The salt is very deliquescent. It should be entirely soluble in 2 parts of water.

Action. Uses.—Alterative. It is contained in some mineral waters, and may sometimes be given with advantage in scrofulous cases.

Dose.—Gr. x.–gr. xxx. A solution of one part in ten is used as a test, and the dry salt is employed in chemical processes as an absorbent of water. It is used in preparing Hydrochlorate of Morphia.

Calcis Phosphas, B.

(Precipitated) Phosphate of Lime. Triphosphate of Lime. Bone Phosphate. *F.* Phosphate de Chaux. *G.* Phosphorsaurer Kalk. Knochenerde.

Bone Phosphate of Lime, as its name indicates, constitutes the earthy matter of bones, teeth, and horns. Some animal excretions, as the Tartar of the teeth, the Phosphate of Lime calculus, are formed of it. It exists also in wheat and almost all plants. It is obtained by burning bones or horns (*see* Cornu Cervi), and is employed for obtaining Phosphorus and Phosphate of Soda. (q. v., pp. 38 and 116.)

It is a white powdery substance, insipid, and insoluble in water. In the presence of decomposing organic matter, water will dissolve a considerable quantity of Phosph. Lime (Wöhler). This is the way in which bone earth fertilises soils. At high temperatures it fuses, and is converted into an opaque enamel. Bone ashes are composed of this Phosphate with a little Carbonate of Lime. The Carbonate forms about 6 per cent. of the ash of Ox bones. Bone Phosphate consists of 1 Eq. of the Tribasic Phosphoric′ with 3 Eq. of Lime. It is a Triphosphate ($3\,CaO, PO_5 = 155$).

Prep.—To get rid of the Carbonate and other impurities, the B. P. digests *Bone earth* in HCl. By this the whole is dissolved, the Carbonate being decomposed with evolution of CO_2, forming $CaCl$. Ammonia is now added to saturation, the precipitate collected, well washed, and dried. The Phosphate only is precipitated; the $CaCl$ being decomposed by the Ammonia, yields lime, which is dissolved. The result is very minutely subdivided.

Action. Uses.—Operation uncertain. Proposed formerly to be used in Mollities Ossium. It is a constituent of James's Powder, and of Pulv. Antim.

Dose.—Gr. x.–ʒß.

Calcis Hypophosphis. Hypophosphite of Lime.

This salt crystallises in flattened prisms of a pearly lustre. It is soluble in 6 parts of water, insoluble in rectified spirit. It is made by boiling Phosphorus with milk of lime, till the odour of phosphuretted hydrogen is no longer perceived. 4 parts of fresh lime are used for 1 part of phosphorus. The water is decomposed. Its oxygen unites with part of the phosphorus, forming Phosphoric acid (PO_5) and Hypophosphorous acid (PO). These both unite with lime, the phosphate precipitating, the hypophosphite remaining in solution. The hydrogen of the water unites with more of the phosphorus, forming a gas which takes fire spontaneously.

Action. Uses.—Stimulant and tonic. It has been recommended in tuberculous disorders.

Dose.—Gr. ii.–gr. v., in syrup. It is employed in the preparation of other hypophosphites.

EARTHY METALS.

MAGNESIUM.

F. Magnésium. *G.* Magnium.

Magnesium (Mg = 12) is a metal which has been obtained by decomposing Chloride of Magnesium by Potassium, or Sodium. It is of an iron-grey colour, brilliant, hard, and ductile; Sp. Gr. 1·75; volatile at about the same temperature as zinc; not acted on by water nor by air, except at a high temperature, when it becomes oxidised, and forms Magnesia. As a Chloride, it forms a constituent of Sea water; oxidised and combined with acids, it exists in Sea water and in numerous mineral springs, and as a Hydrate or native Magnesia in a few places. It forms a portion of Serpentine, Soapstone, Mica, Talc, and many other minerals. It exists in most plants, as in the straw of wheat; also in small quantity in the animal system, especially in the urine and in some urinary calculi. The Oxide, or Magnesia, may be obtained by burning the Carbonate, as Lime is by burning Limestone, or by adding Potash or Soda to a solution of one of its salts.

MAGNESIA, B.

Oxide of Magnesium. *Magnesia Usta.* Calcined Magnesia (Heavy). *Talc Earth.* *F.* Magnésie. *G.* Talkerde. Bittererde.

The name Magnesia (Mg O = 20) occurs in Geber, and afterwards in alchymical works, with various meanings. The present substance was called *Magnesia alba*, and introduced as a medicine in the beginning of the 18th century. It was at first supposed to differ little from Carb. Lime. Hoffman first, and then Dr Black (1756), clearly established the distinction between it and Lime.

Prop.—Magnesia is a white and light, very finely divided, powdery substance, devoid of smell, but earthy in taste. Sp. Gr. 2·3. When moistened, it just turns green the syrup of Violets, and browns Turmeric paper. It is hardly soluble in water, requiring 5142 parts of cold, and 36,000 parts of hot water. (Fyfe.) Water sprinkled on it becomes absorbed to the extent of about 18 per cent. without the evolution of heat. It is slightly soluble in Alcohol. It attracts moisture and Carb′ from the atmosphere, and becomes slowly converted into the Carbonate. It is infusible, except under the oxy-hydrogen flame, and consists per cent. of Magnesium 60 + O 40 = 100.

Acids readily unite with Magnesia, and form salts, of which those which are soluble, and especially the Sulphate, are bitter, readily distinguishing it from other earths. Caustic Potash decomposes these salts, and throws down Magnesia, which retains about ¼ of water, forming the Hydrate, of a somewhat gelatinous consistence. The Carbonates of Potash and of Soda produce precipitates of Carb. Magnesia. The Bicarbonates form a soluble Bicarbonate, precipitable by heat. If the Sesquicarbonate of Ammonia be added, and after this a solution of Phosphate of Soda be dropt in, a copious precipitate takes place of triple Phosphate of Magnesia and Ammonia. The direct addition of Phosphate of Ammonia to the solution of any salt of Magnesia will produce the same effect. Magnesia may be distinguished from Lime by Sesquicarbonate of Ammonia, which precipitates Lime, but not Magnesia; also by Oxalate of Ammonia, which does not precipitate Magnesia, but throws down Lime readily. Ammonia in excess throws down Magnesia, but not Lime, from neutral solutions.

Prep.—B. Introduce *Carbonate of Magnesia* into a Cornish or Hessian crucible closed loosely by a lid, and let this be exposed to a low red heat as long as a little of the powder taken from the centre of the crucible, when cooled and dropped into dilute sulphuric acid, gives rise to effervescence. The product should be preserved in corked bottles.

Here, as in the case of Carb. Lime, Carb′ and water are expelled at a high temperature, to the extent of 50 or 60 per cent., and the Magnesia remains in its pure state, of which the density may be increased according as the heat is augmented.

This preparation, obtained from the ordinary or heavy Carbonate, is heavier, and occupies less bulk than the Magnesia made by calcining the light Carbonate.

MAGNESIA LEVIS, B. Light Calcined Magnesia.

It is obtained by the same process from the Light Carbonate of Magnesia. It is so much more bulky that it occupies 3½ times as much space as a similar weight of Heavy Magnesia. It is supposed to be somewhat more soluble in the juices of the stomach, and is used to make Pulvis Rhei Comp.

Tests.—Magnesia, being prepared from the Carbonate, is apt to contain some of the impurities of the salts from which it is made, as Lime, Alumina, and Silica, and, when long kept, some of the Carbonate. H Cl dissolves Magnesia (50 grs. sol. in Dil. H Cl f℥j.) without effervescence, showing the absence of Carbonate. If Silica be present, it will be left undissolved. The solution in H Cl neutralised by a mixed solution of Ammonia and Hydrochlor. Ammonia gives a copious crystalline precip. (ammonio-phosphate of magnesia) when Phosphate of Soda is added to it. (B.) Muriate of Ammonia prevents the precipitation of Magnesia. Thus, in a solution acidified by H Cl, Magnesia cannot be precipitated by adding Ammonia in excess, but any Alumina will be thrown down. No precipitate is thrown down by Oxalate of Ammonia from a neutral solution in H Cl, showing absence of Lime; and none by Chlor. Barium, showing absence of Sulph. Mag. and of Carb. Soda. Turmeric ought to be only slightly browned.

Inc.—Acids, Acidulous and Metallic Salts, and Hydrochlorate of Ammonia.

Dose.—Antacid, gr. x.–gr. xxx.; as a laxative, gr. xx.–ʒj.; for infants, gr. ij.–gr. x.

Action and Uses of Magnesia and its Salts.—Pure Magnesia and its Carbonate are very similar in their action on the system. They dissolve to some extent in the acid fluid of the stomach, and are then absorbed. During this solution the Carb. evolves $C\,O_2$, which in cases of flatulence may form an objection to its use.

Magnesia is antacid, and acts on the bowels as a laxative; but if given habitually as a purgative, there is a danger of its concreting into a mass in the bowel. It is appropriate in cases of heartburn and acid dyspepsia, in diarrhœa, in gout and in calculous complaints with acidity of urine. Alone, or with Rhubarb, it may be used as a purgative for children.

The Bicarbonate is soluble in water. Its solution forms an elegant antacid medicine.

The Sulph. Magnesia, a soluble cryst. salt, is in common use as an active hydragogue purge. It increases the amount of urine, and acts upon the blood as a saline antiphlogistic. It is thus often used in inflammatory or febrile complaints.

MAGNESIÆ CARBONAS, B.

Magnesiæ Carbonas ponderosa. Heavy Carbonate of Magnesia. *Magnesia alba.* *Magnesiæ Subcarbonas.* *F.* Carbonate de Magnésie. *G.* Kohlensaure Bittererde. Kohlensaure Talkerde.

Carbonate of Magnesia ($MgO, C\,O_2 = 42$), at first called *Magnesia alba*, and *Comitissæ Palma Pulvis,* was used as a medicine by the Count de Palma at Rome, whence it was also called *Pulvis albus Romanus.* It was introduced into the list of the Materia Medica by F. Hoffman. It is found in nature in some mineral waters, in some of which, however, it may exist in the form of the Bicarbonate. In an impure state it forms a constituent of Dolomitic or Magnesian Limestone, and in a comparatively pure state, of a hill in the Peninsula of India, which yielded Magnesia 46, Carbonic Acid 51, Insoluble Matter 1·5, Water 0·5, loss 1 = 100.

Prop.—Pure Carbonate of Magnesia is sometimes found in nature in rhombohedral crystals; as usually seen, the officinal Carbonate is of a white colour, light and soft to the touch, without smell, devoid of any other than an earthy taste when properly prepared. It is unalterable in the air, and nearly insoluble in water, but more soluble in cold than in boiling water. Its solubility is much increased if C' be present, 48 parts of water being said to be then sufficient. In fact, it is then converted into the Bicarbonate of Magnesia; by spontaneous evaporation 1 Eq. of C' escapes, and the neutral Carbonate is deposited, being insoluble. It is decomposed by acids and by a strong heat, its Carb. being expelled. The officinal preparation is not a simple Carbonate, but consists, according to the analysis of

Phillips and Fownes, of 1 Eq. of Bihydrate of Magnesia with 4 Eq. of the hydrated Carbonate, or, according to the B. P., of 1 of the former with 3 of the latter. $Mg\,O, 2\,H\,O + 3\,(Mg\,O, C\,O_2, H\,O)$.

Prep.—B. Dissolve *Sulphate of Magnesia* ℥x., and *Carbonate of Soda* ℥xij., each in a pint of boiling *Dist. water;* mix the two solutions, and evaporate the whole to perfect dryness, by means of a sand bath. Digest the residue for half-an-hour with two pints of boiling Dist. water, and having collected the insoluble matter on a calico filter, wash it repeatedly with Distilled water until the washings cease to give a precipitate with Chloride of Barium. Finally, dry the product at a temperature not exceeding 212°.

[Manufacturers employ various other processes by which to obtain it from the Native or Crude Carbonate; from Chloride of Magnesium in the residue of Bittern; and from Magnesian Limestone, out of which it may be dissolved by means of water charged with $C\,O_2$.]

Here the Sulphate of Magnesia and the Carbonate of Soda mutually decompose each other; the Sul′ uniting with the Soda forms a Sulphate of Soda, which remains in solution, while the Carb′ unites with the Magnesia. The salt formed being insoluble, is precipitated as a Hydrated Carbonate of Magnesia; but, in consequence of a portion of the Carb′ escaping, it is not strictly neutral. Professor Graham states that Carb. Soda is not so suitable as Carb. Potash for precipitating Magnesia, "as a portion of it is apt to go down in combination with the Magnesian carbonate; but it may be used, provided the quantity applied be less than is required to decompose the whole Magnesian salt in solution." The ebullition is necessary to promote the complete separation of the Carbonate. Some $C\,O_2$ being evolved (*vide suprà*), forms, with a portion of the Carbonate, a soluble Bicarbonate in the cold. This is decomposed by boiling. Carbonate of Magnesia is sometimes pressed, when in the moist state, into the form of cubes. Considerable differences are observed in the density of Carbonate of Magnesia, according to the mode of preparation.

There are two kinds, the *Heavy Carbonate* and the *Light Carbonate.* According to Dr Pereira, the formation of the heavy kind is promoted by mixing concentrated solutions at a high temperature, and with the Carb. Soda in excess; that of the light Carbonate by using dilute solutions, in the cold, with an excess of Sulph. Magnesia. But the concentration and the temperature are the chief causes of the precipitation of the heavy kind. The B. P. uses the same proportions of Mag. Sulph. and Carb. Soda. The precipitation of the light Carbonate takes place more slowly; for which reason it is seen under the microscope to be in great part composed of minute prismatic crystals; whereas the heavy Carbonate presents the appearance of a number of roundish grains, the largest of which are highly refracting. (*p.*) By the formula above, the heavy Carbonate is produced.

Magnesiæ Carbonas Levis, B. Light Carbonate of Magnesia.

Prep.—B. Dissolve *Sulphate of Magnesia* ℥x., and *Carbonate of Soda* ℥xij., each in half-a-gallon of *Distilled water;* mix the two solutions cold, and boil the mixture in a porcelain dish for fifteen minutes. Transfer the precipitate to a calico filter, and pour upon it repeatedly boiling *Distilled water* until the washings cease to give a precipitate with Chloride of Barium. Lastly, dry by a heat not exceeding 212°.

Tests.—The Carbonate, like pure Magnesia, may contain alkaline Carbonates or Sulphate of Soda, sometimes Gypsum, Lime, and Alumina. The water in which it is boiled should not alter the colour of Turmeric, showing the absence of any alkaline Carbonate. Chloride of Barium or Nitrate of Silver, added to the water, does not precipitate anything, the first indicating the absence both of Sulphates and of Carbonates of Soda, and the second, if no precip. insoluble in N′, of any Chloride. When the Carbonate is dissolved in an excess of H Cl, an excess of Ammonia occasions only a scanty precipitate of Alumina, and the filtered fluid is not precipitated by Oxalate of Ammonia or Bicarbonate of Potash, showing the absence of any Calcareous salt, and of Alumina. 100 parts dissolved in dilute Sul′ lose 36·6 parts in weight of Carb′. The light Carbonate is distinguished from the heavy Carbonate by its difference in density, and is seen under the microscope to be partly amorphous, with numerous slender prisms intermixed. (B).

Inc.—Acids and Acidulous and Metallic Salts, Hydrochlorate of Ammonia, and Lime water.

Action. Uses.—Antacid, Laxative. Very similar to Magnesia, but differs in Carb′ gas being extricated when it meets with acids in the stomach. Sometimes given in effervescence. Apt to form concretions if taken for a time.

Dose.—Gr. v.–gr. xx. as an Antacid ; gr. xv.–gr. lx. as a Laxative, with water, milk, &c. ; 14 grs. = xx. of Citric acid, in effervescence.

LIQUOR MAGNESIÆ CARBONATIS, B. Solution of Carbonate (*or Bicarbonate*) of Magnesia. *Fluid Magnesia.*

Prep.—B. Take of *Sulphate of Magnesia*, ℥ij. ; *Carbonate of Soda*, ℥ijß. ; *Distilled water*, a sufficiency. Dissolve the two salts separately, each in half-a-pint of water. Heat the solution of Sulphate of Magnesia to the boiling point, then add to it the solution of Carbonate of Soda, and boil them together until Carbonic acid ceases to be evolved. Collect the precipitated Carbonate of Magnesia on a calico filter, and wash it with Distilled water until what passes ceases to give a precipitate with Chloride of Barium. Mix the washed precipitate with a pint of Distilled water, and, putting them into a suitable apparatus, pass into it pure washed Carbonic acid gas obtained by the action of Sulphuric acid on Chalk. Let the mixture remain in contact with excess of Carbonic acid, retained there under pressure for about twenty-four hours, then filter the liquid to remove any undissolved Carbonate of Magnesia, and again pass Carbonic acid gas into the filtered solution. Finally, keep the solution in a bottle securely closed, to prevent the escape of Carbonic acid.

Introduced in 1867. This solution contains about 13 grains of Carbonate of Magnesia in a f℥. It resembles the well-known solutions of Dinneford and Murray. It probably contains the Bicarb. Magnesia. When opened, it effervesces slightly, or not at all, but loses CO_2 slowly, and deposits the Carbonate. It has no bitter taste. When ℥j. is evaporated, and the residue calcined, 5 grains of pure Magnesia remain. (B.)

The Bicarbonate of Magnesia ($Mg\,O,\ 2\ C\,O_2=64$) is found in some mineral springs in France, &c. Carbonate of Magnesia becomes soluble when a current of Carbonic acid gas is passed into a mixture of Carbonate of Magnesia and water. A preparation made in Paris in 1821 contained 6 times as much as an English preparation, which contained 36 grains in each bottle. A. Mayler mentions that Mr Lawrence had been able to dissolve as much as 15 grains of neutral Carbonate of Magnesia in an ounce of water. The French apothecaries prepare an *Eau Magnésienne gazeuse*, which contains ʒj. of Magnesia in a bottle of 22 ounces; a Bicarb. Magnesia is, in fact, formed, with a large excess of Carb′. The second kind, called *Eau Magnésienne saturée*, is not effervescing, and contains half-an-ounce of Magnesia in water Oj., or about 9 grs. in ℥j.

Dr Christison says that a bottle which holds about ℥viij. may contain 72 grs. of Carb., and ought to hold at least 20 grs. in solution. The solution prepared by Mr Dinneford is now identical with that of the P. B. That examined by Dr C. yielded what was equivalent to 8·96 of commercial Carb. in a f℥. The fluid Magnesia of Sir J. Murray, analysed by Professors Daniell, Kane, and Davy, yielded in each f℥ 13 grs. of pure Carb. Magnesia.

A substitute, as suggested by Dr P., may be prepared by pouring the ordinary Soda water, that is, Carbonic acid water, over the common Carb. Magnesia contained in a tumbler; or a mixture of crystallised Sulph. Magnesia and Crystallised Carb. Soda, in powder, and in atomic proportions (viz., 123 parts of the former to 143 parts of the latter salt) may be substituted for the Carbonate of Magnesia. By dissolving these quantities together in water, Bicarb. Magnesia and Sulphate Soda are formed by a mutual decomposition. This is something similar to the double Carbonate of Magnesia and Soda, sometimes sold as *Soluble Magnesia*.

Action. Uses.—Much the same as Carb. Magnesia, but a more agreeable form for exhibition in Dyspepsia and the Lithic acid Diathesis.

Dose.—f℥j.–f℥ij.

MAGNESIÆ SULPHAS, B.

Sulphate of Magnesia. Epsom Salts. *Vitriolated Magnesia. F.* Sulphate de Magnésie. *G.* Schwefelsaure Bittererde.

This salt was first discovered in 1675 by Dr Grew, in a spring at Epsom. It is found in many countries effloresced on the soil, and on rocks which contain a Sulphate or Sulphuret. It is called *hair salt* and *bitter salt*. It exists in many mineral springs, and in Sea water in the proportion of 15·5 grains in a pint. Its true nature was fully explained by Dr Black in 1755.

Prop.—Sulphate of Magnesia ($Mg\,O,\ S\,O_3+7\ H\,O=123$) is commonly prepared in acicular crystals, but it may be crystallised n quadrangular or hexangular prisms acuminated by two to six planes, the primary form being a right prism with a rhombic base.

The salt is colourless, transparent, and sparkling, of a saline nauseously bitter taste. Unalterable or slightly efflorescent, according to the dryness of the air. Sometimes, but only when impure, deliquescent. Insoluble in alcohol, soluble in its own weight of water at 60°, and in less than $\frac{3}{4}$ at 212°. Exposed to heat, the crystals melt in their water of crystallisation, of which 6 eq. are at length dissipated ; the salt is then fused into an enamel without decomposition. If moistened when in the anhydrous state, water is reabsorbed with increase of temperature. Sulph. Magnesia is decomposed by Potash, Soda, and their Carbonates, the bases producing a precipitate of Magnesia, and their Carbs. one of the Carb. Magnesia. The Bicarbs. Potash and Soda, and the Sesquicarb. Ammonia do not produce precipitates, because the Bicarb. Magnesia, which is produced, is soluble, and no precipitate takes place, unless a portion of C′ is expelled by heat. Lime, Baryta, and their soluble salts decompose it, producing a precipitate of Sulph. Lime or of Baryta. Ammonia decomposes it readily if aided by heat, otherwise partially, forming a triple Sulphate. If Sesquicarb. Ammonia be added to its solution, and then Phosph. Soda, a precipitate is obtained of Ammoniaco-Magnesian Phosphate. Comp. Mg O 16·3, S′ 32·5, Aq. 51·2=100.

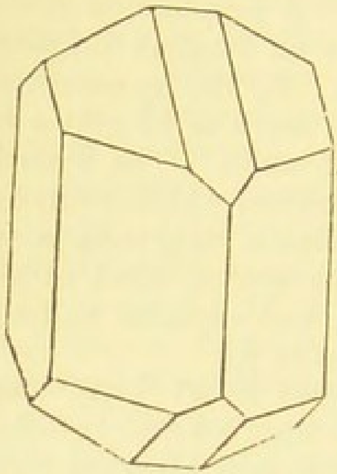

Fig. 21.

Prep.—The *bittern* of Sea water, which is left after the crystallisation of Common Salt, contains Sulph. Magnesia and Chlor. Magnesium. By simple evaporation the Sulph. Magnesia may be separated by crystallisation. Sometimes Sul′ is added to convert the Chloride into a further quantity of Sulph. Magnesia.

At Lymington, in Hampshire, two kinds are manufactured. The first, called *single*, obtained by the cooling down of a concentrated solution in wooden troughs, is moist, and contains a considerable quantity of Chloride (deliquescent). When redissolved and recrystallised, the second, which is called *double* Epsom Salts, is obtained ; this is pure, and permanent in ordinary states of the atmosphere. Sulph. Magnesia is also prepared from Dolomitic Limestone, which consists of Carbonates of Lime and Magnesia mixed together in various proportions. One method is to heat this Magnesian Limestone, and to decompose it with diluted Sul′. Sulphate of Lime, comparatively insoluble, is formed, as well as Sulph. Magnesia, which, being soluble in water, is easily separated and purified by crystallisation. Or the mineral may be calcined, when the Carb′ being expelled, the caustic Lime and Magnesia are first hydrated by being moistened with water, and then the Lime converted into Chloride of Calcium by adding only sufficient H Cl to effect this object, the Lime taking the H Cl, to the exclusion of the Magnesia. The Chloride being readily soluble in water, is by this means easily separated from the Magnesia, which is converted into the Sulphate by the addition of Sul′ or of Sulphate of Iron. Or the Hydrated Lime and Magnesia may be boiled with Bittern, which contains Chloride of Magnesium. This last is decomposed by the Lime. Chlor. Calcium is formed, and remains in solution, while the Magnesia of the Bittern is separated, and obtained tolerably pure, with the Magnesia of Dolomitic Limestone, and may, as before, be converted into Sulphate of Magnesia. These three processes were patented in 1816 by Dr Henry of Manchester.

[Other sources of Sulph. Magnes., besides the two just mentioned, are resorted to by the manufacturers. It may be obtained by acting with SO_3 on the native carbonate, or in a similar manner from the Magnesian Schist of Italy, or by various processes from the residue of the Alum manufacture. In 1862, 800 tons of Epsom Salts were manufactured annually from Carbonate of Magnesia, obtained from the island of Eubea. At South Shields 1000 tons annually were made by the purification of *Rough Epsoms*, which crystallise from the residual liquors of the Yorkshire Alum works.]

Tests.—Apt to contain as impurities Chlor. Magnesium, Sulph. Soda, or a little Iron; but that commonly sold is sufficiently pure for medical purposes. Chlor. Magnesium may be suspected when the salt is moist. Very readily dissolved by water. Sul′ dropped into the solution does not expel any HCl, showing there is little if any Chloride present, which will also be shown by the absence of a precipitate with Nitr. Silver. Its solution at ordinary temperatures is not precipitated by Oxalate of Ammonia, showing absence of Lime. 100 grs. dissolved in water, and mixed with a boiling solution of Carb. Soda, yield 34 grs. of Carb. Magnesia when dried, and this, heated to redness, weighs 16·26 gr. (Magnesia.) If this quantity be obtained, the salt is unmixed with Sulph. Soda. Sulph. Soda used sometimes to be mixed with this salt when it was dearer, and was made to resemble it by being rapidly crystallised with the assistance of agitation. A minute quantity of Iron is sometimes present, giving to its solution a reddish tint. (*See* Tests for Iron.)

Inc.—Potash, Soda, and their Carbs., Lime water, Chlorides of Calcium and of Barium, Acetate of Lead.

Action. Uses.—Cathartic, Diuretic. A common constituent of a Black Dose.

Dose.—ʒij.–℥j.

Pharm. Prep.—Enema Magnesiæ Sulphatis. Mist. Sennæ Co.

ENEMA MAGNESIÆ SULPHATIS, B.

Prep.—Dissolve *Sulph. Magnesia* ℥j. in *Mucilage of Starch* ℥xv., add *Olive Oil* ℥j., and mix.

A cooling demulcent purge in cases where rapid evacuation of the lower bowel is desired, or when it is difficult to administer the dose by the mouth.

CHLORIDE OF MAGNESIUM, more commonly called Muriate of Magnesia, is found in a few saline springs, and in the waters of the ocean (about 23 grains in a pint).

Citrate of Magnesia has been lately introduced as a medicine. There is some difficulty in its preparation, as the salt is apt to assume an insoluble form (Robiquet). Robiquet prepares it by mixing Carbonate of Magnesia 63 parts, with Citric acid 100 parts, dissolved in a small quantity of water, taking care to avoid any elevation of temperature. The product is dried in a stove, and forms a light, spongy, brittle mass, which should be readily soluble in water. It is a mild saline, and may be given in effervescence by mixing 14 parts of dried Citric acid with 10 Carb. Magnes., and adding to water when required. A preparation has been sold as *Effervescing Citrate of Magnesia*, which contains no Magnesia at all, but is analogous to the *Sodæ Citro-tartras effervescens* of the B. P. (1867).

Aluminum and Alumina.

The metal Aluminum or Aluminium ($Al = 13{\cdot}75$) was discovered by Sir H. Davy, and carefully examined by Wöhler in 1828. It has lately been produced in considerable quantity by M. Deville of Paris. It is the base of its only known Oxide, Alumina, which is a Sesquioxide, like that of Iron ($Al_2\,O_3 = 51{\cdot}75$). In its impure state, and combined with Silica, it is abundantly diffused, being the essential constituent of all clays and contained in many rocks. It exists in the purest form in the Sapphire, &c., less pure in Corundum and Emery, and in many minerals. It may be obtained by treating solution of Alum with an excess of Ammonia, when a copious precipitate of white gelatinous Hydrate of Alumina falls down. It is also precipitated by the alkaline Carbonates.

Alumina is devoid of smell or taste, but adheres to the tongue ; is very infusible, has a great affinity for water, attracting it from the atmosphere to the extent of $\frac{1}{3}$ of its own weight. When mixed with water it is distinguished by its plasticity ; hence, in its impure state, it has from the earliest times been employed in pottery. It has also a strong affinity for various organic substances, and, among them, for different colouring matters ; salts, therefore, which contain it, have been long employed in dyeing and in calico-printing. Alumina in the state of Hydrate is soluble in caustic Potash or Soda, and likewise in dilute acids. It may be distinguished by the formation of octohedral crystals of Alum, on evaporating its solution in Dil. Sul′, to which some Sulphate of Potash has been added.

Alumen, B. Alum.

Sulphate of Ammonia and Alumina. Ammonia Alum (B. P. 1867). Sulphate of Potash and Alumina. Potash Alum (B. P. 1864 and L. P.) *Argilla Vitriolata. Sulphas Aluminaris. F.* Alun. *G.* Alaun.

The names Alumen of the Romans (Pliny, xxxv. c. 15) and *στυπτηρια* of the Greeks (Diosc. v. c. 122) were no doubt applied to several salts of the nature of vitriols, and among them to the natural

Sulphate of Iron. The Arabs also included a variety of salts under the name of *Shib*, and understood it as a generic term. Alum, however, was probably not unknown, as Pliny (xxxv. c. 15, § 52) says, "Quoniam inficiendis claro colore lanis, candidum liquidumque utilissimum est." The Egyptians and Hindoos have from the very early ages been acquainted with the arts of dyeing and of calico-printing. The Hindoos are universally acquainted with the properties of (Potash) Alum, and employ it for clarifying muddy water, as well as in both the above chemical arts. It may be obtained in every Indian bazaar, and is manufactured in Cutch. The first Alum works known to Europeans were established at Roccha, formerly called Edessa, in Syria (whence the commercial name of Roch Alum), then near Smyrna, whence the Genoese and others supplied Europe. About the middle of the 15th century they were established in Italy, afterwards in Germany, Spain, and at Whitby in England in the reign of Elizabeth. (Aikin, *Dict.* i. p. 43.)

There are several kinds of Alum known to chemists. The best known is *Potash Alum*, a tersulphate of Alumina combined with Sulphate of Potash. *Soda Alum* and *Ammonia Alum* are formed by replacing the equivalent of Potash with one of Soda or Ammonia. *Iron Alum* results when the Alumina is replaced by peroxide of Iron. These Alums have all the same crystalline form, and resemble each other in astringency and medicinal properties. As Ammonia Alum has the same value in the arts as Potash Alum, and is far more easily and cheaply made, by means of the Sulphate Ammonia obtained from gas liquor, it has to a great extent taken the place of the old Potash Alum in commerce. Ammonia Alum is now adopted in the B. P. of 1867, instead of the other kind, which up to this time has alone been recognised.

Prop.—The Sulphate of Alumina and Ammonia ($NH_4O, SO_3 + Al_2O_3, 3SO_3 + 24 Aq. = 463{\cdot}5$), when pure, is without odour, colourless and transparent, of a sweetish, acidulous, and powerfully astringent taste. It reddens Litmus and other vegetable colours, and strikes a green with Syrup of Violets. (*p.*) When perfectly crystallised, it is seen in the form of regular octohedrons, but often only as four-sided pyramids, or in large seemingly irregular masses. The Potash Alum of commerce, called Roch Alum, is in small crystalline fragments, with less transparency, and of a reddish hue. Sp. Gr. 1·71. The large masses, when immersed in water for a few days, display on their surfaces octohedral, triangular, and rectangular forms. Alum is soluble in about 18 parts of water at 60°, but in about ¾ its own weight of boiling water. It has a sweetish astringent taste. In a dry atmosphere, its crystals are slightly efflorescent ; at a moderate temperature (as 92°) it melts in its own water of crystallisation, boils up, and if the heat be continued, the water to the extent of 47 per cent. being evaporated, a light white spongy powder, or Burnt Alum, is

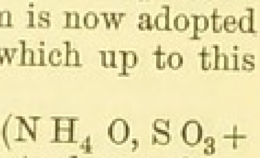

Fig. 22.

left. By a stronger heat the acid is partly expelled and partly decomposed, the Ammonia is driven off from Ammonia Alum, and the remainder, consisting of Alumina (with Sulphate of Potash in the case of Potash Alum), is insoluble in water. Alum is decomposed by the action of carbonaceous matter at a high temperature, forming the Pyrophorus discovered by Homburg and Lemery. Alum is decomposed by the alkalies, the alkaline earths, and by their Carbonates, which combine with its acid and precipitate its Alumina. This is soluble in an excess of the fixed alkalies. Ammonia Alum, heated with fixed alkalies, evolves Ammonia, and is thus easily distinguished from the other kind. Alum is composed of 1 eq. of Sulphate of Alumina and 1 eq. of Sulphate of Potash or Ammonia, with 24 eq. of water.

One eq. contains 4 eq. of $S O_3$, 1 in Sulph. Potash or Ammonia, and 3 in Sulph. Alumina ($Al_2 O_3$, $3 S O_3$). For it is a general rule in chemistry that the eq. of acid in a salt correspond in number to those of Oxygen in the base. (Thus the Persulphate of Iron also contains 3 eq. of Sulphuric Acid.) Some Alums contain both $K O$ and $N H_4 O$.

Prep.—Alum is manufactured in large quantities for use in the arts as well as in medicine. This is always in situations where there is some Aluminous rock, that is, one containing Alumina, and a Sulphuret, usually of iron (sometimes a salt of Potash). It is exposed to the air, either with or without heat. The Sulphur attracting Oxygen is converted into Sulphuric acid, which combines with the Alumina and also with the oxidised Iron. The Sulphate of Iron is separated, and a salt of Potash or Ammonia is added to the vitriolic solution of Alumina. In Cutch, Carb. of Potash is added to a solution obtained by boiling the blue clay, after it has been exposed for 5 months to the air and watered for 10 or 15 days. By due evaporation, and a repetition of the boiling and evaporation, crystals of Alum are obtained.

The chief British manufactories are at Hurlet, near Paisley (where simple exposure to air is adopted), and at Whitby, in Yorkshire (where aluminous schist is calcined in heaps). Alum is made by Mr Spence from calcined Shale or Cornish Slate, which is acted upon by dilute $S O_3$. It is also obtained from the ash of Scotch cannel Coal, which is largely used in the manufacture of gas. To the solution of Sulphate of Alumina, obtained from any of these sources, Sulphate of Potash is added to obtain Potash Alum; but Sulphate of Ammonia, made by acting on gas liquor with $S O_3$, is now generally used, and on evaporating the solution crystals of Ammonia Alum are obtained.

Tests.—Alum should be colourless, and perfectly soluble in water, showing the absence of any uncombined earthy matter. From the solution, Ammonia or Potash throws down a colourless precipitate of Alumina, which is redissolved when the latter is added in excess. $S O_3$ is known by its tests. No precipitate or blue colour is produced by Ferrocyanide or Ferridcyanide of Potassium (no Iron Alum), or $H S$, but Hydrosulph. Ammonia precipitates Alumina. Heated with Potash or Soda, the Alum of the B. P. evolves Ammonia. A solution, precipitated with Ammonia, and the residue concentrated, the latter (Sulphate Ammonia) is entirely dissipated by heat. The freedom from colour and the solubility prove the purity of Alum. The presence of Iron may also be detected by the addition of Tincture of Galls, which will produce a bluish-black colour in solution containing Iron Alum.

Inc.—Alkalies and their Carbs., Lime and Lime water, &c., Tartrate of Potash, Phosphates, Acetate of Lead, the Salts of Mercury, Gallic Acid, Inf. of Galls and of Cinchona.

Action. Uses.—Alum (of either kind) applied in the form of powder, is slightly caustic. In solution, it acts as an astringent, both topically and remotely. Externally, it is used as a styptic, and to form astringent Collyria, Gargles, Injections, &c. Given internally, it undergoes absorption, and, passing into the blood, it diminishes all the secretions, and checks hæmorrhage at distant parts. It is of more or less use in cases of Hæmaturia, Melæna, and Hæmoptysis. It checks fluxes. It is often given largely in Lead Colic, where it may even act as a purgative, by counteracting the operation of the poison, which is decomposed by Sulphates. (Alum is extensively employed to adulterate bread.)

Dose.—Gr. x.–gr. xx.

ALUMEN EXSICCATUM, B. Dried Alum. *Alumen ustum.*

Alum, when thoroughly heated, forms a light, spongy, opaque mass, losing its water of crystallisation, but retaining its other properties. It loses in drying 47 per cent. of its weight.

Prep.—B. Heat Alum in a porcelain capsule till it liquefies, raise and continue the heat (not allowing it to exceed 400°), till aqueous vapour ceases to be disengaged, then reduce the residue to powder. Care must be taken that the heat is not too powerful, as the Ammonia and a portion of the Sul′ will be driven off.

Action. Uses.—Escharotic ; occasionally given internally.
Dose.—Gr. v.–gr. xv.

[LIQUOR ALUMINIS COMPOSITUS, L. Compound Solution of Alum.

This is a powerful astringent lotion, which used to be called Bates' Alum Water.

Prep.—Dissolve *Potash Alum* and *Sulphate of Zinc* āā ℥j. in boiling Aq. Oiij. strain.

Action. Uses.—Astringent, Styptic lotion. Diluted with Rose water, used as a Collyrium and Injection.]

METALS PROPER.

MANGANESIUM. *F.* Manganese. *G.* Mangan.

Manganese (Mn = 27·5), the first of the metals proper to be treated
f, is not itself officinal, but one of its Oxides is so on account of its
harmacopœia use. It is hard, brittle, and of a greyish-white
olour, emitting a peculiar odour when handled or in a moist atmo-
phere. Sp. Gr. 8. When pure, it oxidises readily in the air, re-
uiring to be kept under Naphtha, and is quickly dissolved by Dil.
ulphuric acid. It forms numerous combinations with Oxygen, but
e Black or Peroxide is alone officinal.

Manganesii Oxidum Nigrum, B. Manganesii Binoxidum. Black Oxide of Manganese. *F.* Oxide noir de Manganese. *G.* Manganhyperoxyd.

Prop.—The Binoxide of Manganese ($\mathrm{Mn\,O_2} = 43{\cdot}5$), called also Peroxide, is that found most abundantly in nature. It is variable in appearance, sometimes crystallised in needles, often in compact masses, but most frequently is a dull earthy-looking powder, of a black or blackish-brown colour. It is usually sold in the state of a fine powder. It is devoid of both taste and smell; Sp. Gr. 4·8; insoluble in water; nearly infusible; heated, it gives out Oxygen. Treated with H Cl, Chlorine is evolved, as also when mixed with Chloride of Sodium or Common Salt, and Sul′. A Chloride of Manganese (Mn Cl) is formed, and the second equivalent of Oxygen takes the Hydrogen from another atom of H Cl to form water, setting free Chlorine—

$$\mathrm{Mn\,O_2 + 2\,H\,Cl = Mn\,Cl + 2\,H\,O + Cl.}$$

The percentage comp. of the Oxide is Mn 63·75, O 36·25 = 100.

Tests.—Binoxide of Manganese is seldom pure, usually containing more or less of Oxide of Iron, Carbonates of Lime and of Iron, Sulphate of Baryta, and clayey matter. H Cl, aided by heat, dissolves it almost entirely, disengaging Chlorine; heat disengages Oxygen. It often contains much of the Sesquioxide. Its purity is judged of by the quantity of Oxygen or Chlorine evolved, or by the joint action of Hydrochloric and Oxalic acids.

Action. Uses.—Officinal for aiding in the evolution of Chlorine from Chloride of Sodium (p. 50), for which it is much employed; used to make the Permanganate of Potash; also used for colouring in glass-making and pottery; seldom in medicine. It is useful in Chemistry as a source of Oxygen.

Various soluble preparations of Manganese have been recently introduced as medicines. In small doses they are alterative and tonic, in large doses purgative. At the same time they are stated by Ure and Hannon to have a remarkable power of increasing the secretion of bile. The Sulphate and Acetate of Manganese are soluble in water. They may be given as alteratives in skin diseases and gout, in doses of 5 to 10 grains; or to the amount of ʒj. to ʒij. as cathartics, being especially suitable in torpid states of the liver. They are not astringent. The double Sulphate of Manganese and Iron, and the double Carbonate, combine the remedial properties of their two mineral bases. For the Manganate and Permanganate of Potash, see p. 101.

FERRUM.

Iron. Mars of the Alchymists. *F.* Fer. *G.* Eisen.

Iron (Fe = 28) is found native, when it is supposed to be generally of meteoric origin; extensively in combination with Oxygen or Sulphur; as a Salt of various acids, as Carbonate, Sulphate, &c.; all these being in a more or less pure state, that is, mixed with earths or other metals. It also exists in vegetables, and in the blood of animals. It is extracted from Iron ores. Some of the Oxides, as Magnetic and Specular Iron ore, are heated only with Charcoal, as in Sweden, Elba, and India, when the Carbon combining with the Oxygen, the Iron is set free, and melted. The Carbonate, Iron Pyrites, Clay Iron ore, Red and Brown Hæmatites, and Spathose Iron, are first roasted, and then exposed to a fierce heat in contact with Charcoal, Coke, or Small Coal, and a flux, either Lime or Clay, according as the ore is argillaceous or calcareous. The Carbonic acid, or Sulphur (in pyrites) is burnt away—the Oxygen (Clay ore and Hæmatites) dissipated as $C\,O_2$. The earthy matters become vitrified, and form a slag at the surface, while the heavy particles of Iron, falling down, run out by a hole at the bottom into moulds, and from *Pig* or *Cast Iron.* This is still impure, from the presence of Charcoal, Sulphur, and portions of Silicon and Aluminum. It is again twice fused in the refining and puddling furnaces, and exposed to the influence of a current of air, at a high temperature, when the whole of the Charcoal and Sulphur are burnt out, and the other impurities form a slag. In Bessemer's process liquid crude iron is decarbonised by forcing air through it by machinery. The metal is taken out, beaten or pressed, and then drawn into bars, which form the *Malleable* or *Wrought Iron* of Commerce.

FERRUM, B. Iron. Iron Wire or Nails, free from Rust.

Iron wire and nails are preferred by the Pharm. in making officinal preparations, because they must be made from the most malleable, which is also the purest, Iron. Filings finely divided are useful for exhibition, and may be prepared from pure wire, or by means of the magnet be separated from the impurities with which they are apt to be intermixed in the process of filing.

Prop.—Iron is well known for its hardness and toughness, and consequent application to an immense variety of useful purposes. It is of a whitish-grey colour; is hard, but malleable, and, though more ductile than many, exceeds all the metals in tenacity. It may be highly polished, and takes a sharp edge. Sp. Gr. 7·8. It is remarkable for its power of attracting and being attracted by the Magnet, as well as for itself and some of its compounds becoming magnetic. When heated it becomes soft; at a white heat two pieces may be inseparably joined together, or *welded.* It melts at a bright white heat, or 1587° of Daniel's pyrometer, but is not volatile. If exposed to the air when heated, or when moist, it absorbs Oxygen, and its surface becomes covered with a coat of Oxide. It burns in Oxygen gas with vivid scintillations. It combines either with 1 Eq. O, forming the Protoxide, or with 1½ (two to three), forming the Sesquioxide, often called the Peroxide. It slowly takes the Oxygen of water, Hydrogen gas escaping. When dilute Sul′ is poured upon Iron-filings, the Iron dissolves as a Protoxide, combining with the acid (taking the O from water, and setting free its Hydrogen), and may be precipitated on the addition of an Alkali, in combination with some water, forming a Hydrated Protoxide of a greenish-white colour. This, when exposed to the air, absorbs more Oxygen, and is converted into the red-coloured Sesquioxide, as may be seen in several of the officinal preparations. The Protoxide may be readily converted into the Peroxide by boiling any salt containing it with a little Nitric′. The presence of the Iron may then be readily detected by testing the solution with Ferrocyanide of Potassium, or Tincture or Infusion of Galls: the former will form a blue, and the latter a black precipitate.

Action and Uses of the Compounds of Iron.—The preparations of Iron, grouped together as Chalybeates, are commonly said to be tonics, but they are not of use in cases of simple debility, except when attended with paleness or Anæmia. In Anæmia there is a deficiency of the red particles of the blood, which contain Iron. When a Chalybeate medicine is administered, it is partly or entirely absorbed, according to its solubility, and its passage into the blood is commonly succeeded by an increase in the amount of the red globules. Iron is the only direct remedy which can be employed in Anæmia and its kindred disorders, as Chlorosis, Amenorrhœa, &c.

Some of the Iron compounds, especially the Perchloride and the Sulphate, are astringent and somewhat corrosive. The former may be applied in solution to Condylomata, and is used generally as an astringent externally or internally. Neither this nor the Sulphate can be prescribed in large doses. Among the milder preparations are Reduced Iron, Carbonate of Iron, and the Phosphate of Iron; insoluble in water, but dissolved in the stomach to some extent. Also the Ammonio-citrate and the Potassio-tartrate, which are soluble, and very efficient.

The Iodide of Iron combines the powers of its two constituents; it may be given with great advantage in small doses, in Scrofula combined with Anæmia.

FERRUM REDACTUM, B. Ferri Pulvis. Reduced Iron. Powder of Iron (with Magnetic Oxide).

This has the advantage of being in a state of very minute subdivision. Hydrogen gas is passed over Peroxide of Iron, contained in a gun-barrel, and exposed to a red heat. H uniting with O to form water, the Iron is reduced to the metallic state.

There are many other ways of obtaining Iron in a finely divided state. Zangerle has proposed to make it by igniting a mixture of the Protoxolate of Iron, 5 parts, with 6 parts of dry Ferrocyanide of Potassium, and 1¾ part of anhydrous Carbonate of Potash. When gas ceases to be evolved, the mass is allowed to cool, washed, and dried. (Neues Repertorium für Pharmacie, vi. 27.)

It is said that the Magnetic Oxide of Iron is often substituted for this Iron powder, the *Fer réduit* of Quevenne. It is certain that it often contains as much as 18–20 per cent. of Oxygen, which it probably absorbs from the atmosphere. The B. P. defines it as "metallic iron, with a variable proportion of magnetic oxide of iron." As a subsulphate is frequently formed in the precipitation of the Peroxide, the reduced iron may also contain some sulphuret of iron. This interferes with its utility as a medicine, the H S gas being evolved in the stomach and causing disagreeable eructations.

Tests.—It should be a fine greyish-black powder, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed in a mortar. It dissolves in H Cl with evolution of hydrogen, and the solution has the reactions of the protosalts of iron, giving a blue precipitate with Ferridcyanide of Potassium. The finely-divided iron is dissolved by a solution of Ioduretted Iodide of Potassium. The B. P. states that 10 gr. of *Ferrum Redactum*, gently heated in a solution of 50 gr. Iodine and 50 gr. K I, leave no more than 5 gr. undissolved. The residue is entirely soluble in H Cl. It consists of Magnetic Oxide of Iron, which is insoluble in the Iodine solution.

Action. Uses.—Iron, in a pure state or in filings, is inert; but, in this form, being easily oxidised in the stomach, it acts as a tonic. It is soluble to some extent in cod-liver oil.

Dose.—Gr. v.–gr. x. in Electuary with Honey or Treacle; or in Pills, with some of the Bitter Extracts.

Trochisci Ferri Redacti, B. Reduced Iron Lozenges.

Prep.—Take of *Reduced Iron*, grs. 720; *Refined Sugar*, in powder, ℥xxv.; *Gum Acacia*, in powder, ℥j.; *Mucilage of Gum Acacia*, f℥ij.; *Distilled water*, f℥j., or a sufficiency. Mix the Iron, Sugar, and Gum, and add the Mucilage and Water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Introduced in 1867.

Each lozenge contains one grain of reduced iron.

Dose.—1 to 6 lozenges.

Protoxide of Iron.

Oxide of Iron (Fe O = 36) is obtained when Iron is burnt in Oxygen gas. It is also obtained when Caustic Potash or Soda is added to a solution of the Sulphate of the Oxide of Iron. The white precipitate which falls becomes grey, and then of a bluish-green colour; but this is, in fact, a *Hydrated Protoxide of Iron.* It absorbs Oxygen from the atmosphere, and becomes red, being converted into the Sesquioxide. The Protoxide is a constituent of some officinal salts, as of the Sulph. Iron, and these are usually of a greenish colour, have a metallic taste, and are considered by some to be more efficacious as medicines than those containing the Sesquioxide.

Ferri Peroxidum (Hydratum), B. (Ferri Sesquioxidum, L.) Ferri Oxydum Rubrum. Hydrated Sesquioxide or Peroxide of Iron. *Crocus Martis. Chalybis Rubigo præparata. Ferri Subcarbonas. F.* Peroxide de Fer. *G.* Rothes Eisenoxyd.

The Red Oxide of Iron has been variously named, according to the mode of its preparation, though the product is essentially the same. It is abundantly found in nature; as a constituent of many red soils; crystallised in the form of rhomboids and octohedrons in

Specular Iron or Iron Glance, as in Elba, in many parts of Europe, and in the Peninsula of India (Porto-Nuovo Works); in a compact state, with impurities, in Red Hæmatite or Red Iron ore. These give a reddish-brown streak on paper, and with Borax form a green or yellow glass; are considerably magnetic, but do not, like magnetic Iron, attract Iron filings.

Prop.—The Sesquioxide ($Fe_2\ O_3\ HO = 89$) or Peroxide of Iron, artificially prepared, is a powder of a reddish-brown colour, without smell, but has a slight chalybeate taste, except when prepared by calcination (no taste, B.), is insoluble in water, and does not attract the magnet, unless it contain, as is sometimes the case, some of the Black Oxide. Sp. Gr. 3. It ought to dissolve in H Cl without effervescence; but it usually contains a little Carb′ (2 to 5, sometimes even 15 per cent., according to Mr Phillips). It was therefore formerly called Carbonate and Subcarbonate of Iron, which usually was, what it is now called, merely Peroxide of Iron. The Hydrochloric solution forms a black precipitate with Tinct. or Inf. of Galls, and a blue precipitate with Ferrocyanide of Potassium.

Different processes have at different times been adopted for making this preparation; all are effectual, in consequence of the facility with which Iron, when once oxidised, absorbs a further proportion of Oxygen. Formerly the Sulphate of Iron was calcined, when it lost first its water of crystallisation, and then its acid: some of this, however, yielded a portion of its Oxygen to form the reddish-coloured Peroxide. Or a solution of the Sulph. of Iron may be decomposed by the addition of a sol. of Carb. of Potash, or of Soda, when a Carb. of Oxide of Iron is precipitated. This being dried in the air, the Carb′ soon escapes almost entirely, and the Protoxide absorbs the due quantity of Oxygen from the atmosphere, and from a white, and then green powder, is converted into the reddish-coloured Peroxide. The B. P. prepares it directly by precipitating the Persulphate of Iron with solution of Soda, and driving off the water by heat.

Prep.—B. Heat the moist *Peroxide of Iron* (see below) to 212° until it ceases to lose weight, reduce it to a fine powder, and preserve in a bottle.

Tests.—This preparation may be carelessly prepared, but is not likely to be adulterated. Dissolved totally by dilute H Cl, earthy impurities will remain undissolved; if the presence of metals is suspected, they can be detected by their tests. The hydrated peroxide occasionally contains some subsulphate. The solution in H Cl should give no precipitate with Chloride of Barium. When prepared by exposing the Carbonate, it may retain some unaltered protosalt. In this case the solution in H Cl will be precipitated by the Ferridcyanide of Potassium.

Inc.—Acids and Acidulous Salts.

Action. Uses.—Chalybeate tonic.

Dose.—Gr. v.–gr. xxx. In Neuralgia, gr. xxx.–gr. lx., or even ʒß 2 or 3 times a-day.

For external application, there is a plaster containing this Oxide, which, from the support such applications are calculated to afford, and from the moderately stimulant nature of the ingredients, is in general esteemed as a strengthening plaster.

EMPLASTRUM FERRI, B. Emplastrum Roborans. Iron or Strengthening Plaster.

Prep.—B. Melt together *Plaster of Litharge* ℥viij., and *Burgundy Pitch*, ℥ij., add to them *Peroxide of Iron*, ℥j., and stir constantly until cool.

Uses.—The efficacy of the Oxide of Iron is doubtful. It gives mechanical support to relaxed muscles, and affords warmth and protection to the chests of delicate persons.

FERRI PEROXIDUM HUMIDUM, B. Moist Peroxide of Iron.

This was first introduced by the E. C. as an antidote in cases of poisoning by Arsenious acid. In the B. P. 1864, it was called the Hydrated Peroxide. That name is now more correctly applied to the dry Oxide, which contains one equiv. of water in chemical combination. The humid Oxide contains also 86 per cent. of uncombined water.

Prop.—It is of a yellowish-brown colour, and requires to be kept in a moist state, as it thus combines so readily with Arsenious acid that when prepared according the following formula, and added in the proportion of 12 parts to 1 of Arsenious acid, and well shaken, the filtered liquor which previously contained the Arsenic afterwards displays no traces of its presence, an insoluble Arseniate of the Protoxide of Iron having been formed. (Graham.)

Prep.—B. Add solution of *Persulphate of Iron*, ℥iv., to *Distilled water*, Oj., and gradually pour the dilute solution into *solution of Soda*, ℥xxxiij., or q. s., stirring well for a few minutes; collect the precipitate on a calico filter, and wash it with distilled water, until the filtrate ceases to give a precipitate with chloride of barium. Lastly, enclose the precipitate, without drying it, in a stoppered bottle, or other suitable vessel, to prevent evaporation.

This preparation should be recently made.

The B. P. gives a separate process for the preparation of the Persulphate, a salt of the Peroxide of Iron. In the old formula of the E. P. Ammonia was used as a precipitant. The alkali combines with the SO_3, forming a soluble sulphate, while the Fe_2O_3 is precipitated. Unless carefully washed, some subsulphate is apt to adhere to the oxide, but this is more likely to be the case when a solution of the protosalt is used.

The yellow-coloured rust which forms when Iron is fully exposed to water and to the air, is very much the same in composition as the above, though it is not to be substituted for it as an antidote.

Tests.—Entirely and easily soluble in dilute H Cl without effervescence: the solution gives a blue precipitate with the red Prussiate, but not with the yellow Prussiate of Potash. If previously dried at 180°, a stronger heat drives off about 18 per cent. of water. It should be free from grittiness, and contain about 12 per cent. of Peroxide of Iron. The magnet does not attract it.

Action. Uses.—A good substitute for the dry Peroxide, and generally considered the best antidote to Arsenious acid.

Dose.—Gr. x.–gr. xxx. as a Tonic ; in much larger doses as an antidote.

Ferri Oxidum Magneticum, B. Black Oxide of Iron. Magnetic Oxide. (Fig. 23.) *Æthiops Martialis.* A compound of Protoxide and Sesquioxide of Iron. *F.* Oxide de Fer noir. *G.* Schwarzes Eisen Oxydul. Eisen Mohr.

Black Oxide ($Fe_3 O_4 = 116$) or Martial Ethiops, long one of the esteemed preparations of Iron, was formerly made by moistening Iron-filings with water, and also by levigating the scales of the Oxide found in a smith's forge. It is then probably composed of 1 eq. Protoxide + 1 eq. Sesquioxide of Iron = 116. The B. P. defines it as Magnetic oxide with 20 per cent. of water of hydration, and some excess of peroxide. It is a brownish-black powder, destitute of taste, and strongly magnetic.

Prep.—B. Dissolve *Sulphate of Iron*, ʒij., in *Dist. water*, Oij., and add to it solution of *Persulphate of Iron*, ℥vß., then mix this with solution of *Soda*, Oiv., stirring them well together. Boil the mixture, let it stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with Distilled water until what passes through the filter ceases to give a precipitate with chloride of barium. Lastly, dry the precipitate at a temperature not exceeding 120°. (The ℥vß. of Sol. of the Persulphate correspond to ʒiv. of Sulphate of Iron.)

The object, according to Dr Christison, is to obtain a compound, one-half of the Iron of which is in the state of Protoxide, and the other in that of Sesquioxide, which may be affected by mixing together the Sulphates of the Protoxide and Sesquioxide in the requisite proportions, and then precipitating them both by the addition of Soda or Ammonia in excess. Thus, in the formula of the E. P. the proportion of Sulph. Iron, which was to be peroxidised with Nitric acid, was equal to that which was used as a protosalt. But in the B. formula the portion peroxidised is twice as great as the other portion of Sulphate. The result is closer to the true Magnetic Oxide, in which the proportion of $Fe_2 O_3$ to $Fe O$ should be as 80 to 36. (The product of the E. P. process, which was that of Wöhler, was stated by him to be formed of 2 equiv. of Protoxide, 1 of Sesquioxide, and 2 of water.) The Oxides unite at once in the act of separation, and fall down in the form of a dark greyish-black powder, which, under exposure to the air, either with or without moisture, shows no tendency to undergo further oxidation.

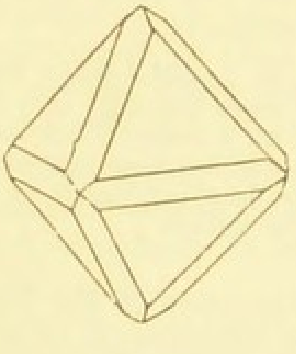

Fig. 23.

Tests.—Brownish-black ; strongly attracted by the magnet ; heat expels water from it. It dissolves without effervescence in H Cl diluted with half its bulk of water, forming a solution of the Perchloride and Protochloride of Iron. This solution gives blue precipitates with the Ferrocyanide Potassium (test for the persalt) and the Ferridcyanide Potassium (test for the protosalt). 20 gr. moistened with Nitric acid and calcined at a low red heat, leave 15·8 gr. of Peroxide of Iron. By the NO_5 the whole of the Iron is peroxidised. 20 *gr. dissolved in* H Cl *continue to give a blue precip. with Ferridcyanide of Potassium, until* 830 *measures of the volumetric Sol. Bichrom. Potash have been added.* The Bichrom. Potash peroxidises the Protochloride.

Action. Uses.—Chalybeate tonic.

Dose.—Gr. v.–gr. xx. 2 or 3 times a-day.

FERRI IODIDUM, B. Iodide of Iron. *Ioduret and Hydriodate of Iron. F.* Iodure de Fer. *G.* Eisen Iodür.

Introduced into practice by Dr A. T. Thomson, and described in his *Obs. on the Prep. and Med. Employment of the Iodurets and Hydriodate of Iron.*

Prop.—Iodide of Iron (Fe I + 4 Aq. = 191) is of a grey or greenish-brown colour, with somewhat of a metallic appearance; its taste is acrid and styptic. It is often prepared in thin cakes, of a crystalline radiated structure, and light grey colour when fractured. If its solution be evaporated with as little contact of air as possible, green tabular crystals are formed. It is very deliquescent, and readily dissolved in water, as also in Alcohol. The solution is green, and when diluted, is not disagreeable in taste. Heated, it readily fuses, and volatilises; but is then easily decomposed, Iodine escaping in vapour, and Iron being left behind, in a more or less oxidised state. From the absorption of Oxygen, the same change takes place on exposure to the air: water is then absorbed to the extent of forming a dark-coloured solution, in which some Iodide of Iron, with a little free Iodine, is held in solution, and a Sesquioxide of Iron precipitated. (The B. P. allows a little Oxide of Iron in the Iodide.) It is difficult to preserve it in solution, unless a coil of Iron wire, as suggested by Mr Squire, be introduced into it. In this case, any Iodine set free combines with the Iron, forming the Iodide again, but though the solution remains pure, some Sesquioxide of Iron is still precipitated. Sugar also has been ascertained to have this preservative effect.

Prep.—B. Introduce *Iodine*, ℥iij., *fine Iron Wire*, ℥iß., and ℥xij. of *Dist. water* into a flask, and having heated the mixture gently for about ten minutes, raise the heat, and boil until the froth becomes white. Pass the solution through a wetted calico filter into a dish of polished iron, washing the filter with ℥ij. of water, and boil down until a drop of the solution taken out on the end of an iron wire solidifies on cooling. The liquid should now be poured out on a porcelain dish, and, as soon as it has solidified, should be broken into fragments, and enclosed in a stoppered bottle.

The weight of Iron used is half that of the Iodine. As the proportion required is less than ¼, or 28 to 127, the Iron is largely in excess. The heat promotes the combination, which is complete when the red colour due to free Iodine is no longer seen. The iron dish is intended to prevent decomposition during the evaporation, but will be soon worn out if often used.

The Messrs. T. & H. Smith make a solution of Iodide of Iron in a Florence flask with ℥vj. of pure iron filings, ℥ij¼. of Iodine, and f℥ivß. of cold distilled water. Boil till the liquid loses its colour, and filter rapidly into another clean flask, and evaporate at a boiling heat. They obtain the compound either as a crystallised dydrate, or in an amorphous anhydrous form, according to the extent of the evaporation, and enclose without the smallest delay in small well-corked bottles. Mr Kop recommends triturating 4 parts of Iodine with 2 parts of water in a large dish; then to add at once 1 part of iron filings in a state of fine division, and to continue the trituration.

The solution, like that of all the protosalts of Iron, is of a green colour. If this be quickly filtered and evaporated, and with as little access of air as possible, the salt may be obtained without much decomposition, but the Iron is apt to pass rapidly to the state of Sesquioxide. As the solid preparation is liable to change, the Messrs Smith recommend to powder their anhydrous Iodide as soon as it is taken from the flask, and then instantly to incorporate it with twice its weight of pure refined sugar in powder, and to make it into a mass with honey. 4 grains will contain 1 grain of the Iodide. Keep in shallow, corked bottles in a layer of some powder. (P. J. iii. 490.)

Tests.—Crystalline, green, with a tinge of brown, inodorous, deliquescent, entirely soluble in water, or nearly so, forming a pale-green solution. It gives off violet vapours when heated, leaving Peroxide of Iron. The solution in an ill-closed vessel quickly deposits Peroxide of Iron, and can be kept clear only in a vessel well closed and containing a coil of Iron wire. It answers to the common tests for Iodine, and for the Protoxide of Iron, *i.e.*, gives blue precipitates with the Ferridcyanide of Potassium and with mucilage of Starch and Chlorine water.

Inc.—Acids, Alkalies, and their Carbonates, Lime water, and all such substances as are incompatible with Sulphate of Iron, such as vegetable astringents.

Action. Uses.—Combines a Chalybeate action with the alterative properties of Iodine. Particularly useful in Anæmia of Scrofulous children.

Dose.—Gr. j.–gr. v. or gr. x. in solution in water (a solution of gr. iij. in fʒj. is a convenient strength), in syrup, or in the saccharine pills. Or it may be conveniently dissolved in Cod-liver oil (4–8 grs. in the oz.), for scrofulous patients.

Syrupus Ferri Iodidi, B. Syrup of Iodide of Iron.

Prep.—B. Prepare a syrup by dissolving *Refined Sugar* ℥xxviij. in ℥x. of *Dist. water* with the aid of heat. Digest *Iodine* ℥ij., and *fine Iron Wire* ℥j. in a flask, at a gentle heat, with *Dist. water* ℥iij., till the froth becomes white; then filter the liquid while still hot into the syrup, and mix. The product should weigh 2lb. 11 oz., and should have the specific gravity 1·385.

The combination of the Iodine with the Iron takes place as before. It is complete when the froth becomes white. The preparation of the L. P. contained 5 gr. of the Iodide in each fluid drachm. This syrup contains 4·3 gr. in the dr. It is still inconveniently strong, especially when used for administration to young children.

Sugar prevents the Protoxide of Iron from passing to the state of Peroxide, as in the Ferri Carbonas Saccharata, and thus has been found to preserve the Iodide of Iron. A syrup was first suggested in Buchner's Repertor. für die Pharmacie for 1839. The E. C. first introduced a formula of the Messrs Smith modified from one proposed by Dr A. T. Thomson, in the Trans. of the Pharm. Society, i. 47. This solution undergoes little change, even when preserved for some time. It ought to be "nearly colourless, or pale yellowish-green, and without sediment." Dr C. cautions against employing common British Iodine unless allowance is made for the moisture of the Iodine. The syrup ought not to be diluted long before it is to be taken, and therefore the patient should himself make the mixture.

Dose.—f ʒß.–ʒj. A weaker preparation may often be used with advantage.

PILULA FERRI IODIDI, B. Pill of Iodide of Iron.

Prep.—Agitate *fine Iron Wire* gr. xl., with *Iodine* gr. lxxx., and *Dist. water* ♏l., in a strong stoppered ounce phial, until the froth becomes white. Pour the fluid upon *Refined Sugar* in powder gr. lxx., in a mortar, triturate briskly and gradually add *Liquorice Root* in powder gr. cxl.

The mass will weigh about 360 grs. or less when dry, containing 100 gr. of Iodide of Iron ; 3–4 gr. of the pill will contain about 1 gr. of Iodide of Iron.

Dose.—Gr. v.–gr. x. These pills should only be used when freshly made.

BROMIDE OF IRON is prepared in precisely the same way as the Iodide, substituting Bromine for Iodine, as in the first part of the process for making Bromide of Potassium. Mr Squire states that a coil of Iron wire traversing the whole column of the solution is necessary to preserve it in a neutral and uniform state, and is perfect in its action. Others prefer the Syrup to the aqueous solution. The Bromide of Iron acts as an energetic Tonic. It is also recommended as an alterative in Dysmenorrhœa, and to relieve a congested state of the uterine organs.

FERRI PERCHLORIDUM. Ferri Sesquichloridum. Perchloride, Sesquichloride, or Muriate of Iron.

Prop.—The Sesquichloride of Iron ($Fe_2\ Cl_3 = 162{\cdot}5$) is one of the more powerful of the Ferruginous preparations. Iron combines with Chlorine both as a Protochloride and a Sesquichloride (*Proto-chlorure* and *Per-chlorure de Fer* of the French). The first is white, in small scales, very soluble in water and alcohol, forming a green-coloured solution, and liable to change from the avidity with which the Iron absorbs Oxygen, and is precipitated as Sesquioxide ; the Chlorine being left in the proportion to form the Sesquichloride. A Tincture of the Chloride is much used on the Continent. Both Chlorides used to be contained in the Tincture of the British Pharm. when it was made with the Black Oxide of Iron. The Perchloride or Sesquichloride is volatile at a red heat. When the solution is concentrated, it yields either orange-yellow crystalline needles radiating from a centre, or large dark yellowish-red crystals. When sublimed, it is in brilliant scales, of a lively hue, very soluble in water, Alcohol, and Ether.

LIQUOR FERRI PERCHLORIDI FORTIOR, B. Stronger solution of Perchloride of Iron.

Prep.—B. Dilute *Hydrochloric acid* ℥viij., with ℥viij. of *Dist. water*, and dissolve in it *Iron Wire* ℥ij. with a gentle heat. Add to the filtered solution *Nitric acid* ʒix., and *Hydrochloric acid* ℥iv., and heat briskly until, on a sudden evolution of red fumes, the liquid becomes of an orange-brown colour. Evaporate in a water bath to f℥x. This solution is of the same strength as that introduced by the B. P. 1864 as Liq. F. Perchloridi. The result of the process of 1864 was not satisfactory, as too little $H\,Cl$ (℥x.) was ordered to convert the Iron into a Perchloride. The Nitric acid of 1867 being different in strength, ʒix. are now ordered instead of ʒvj.

A Protochloride of Iron is first formed, the Hydrogen of the $H\,Cl$ escaping and the Chlorine combining with the Iron. In the second part of the process the Nit′ yields up its Oxygen, which combines with the Hydrogen of the $H\,Cl$, and an additional equivalent of Chlorine unites with 2 equivalents of the Protochloride to form the Perchloride of Iron. The solution, as made by the process as amended, contains about 6 ounces of the Perchloride of Iron in 10 fluid ounces, or 31·7 gr. in a fluid drachm.

Tests.—Orange-brown with a strong styptic taste, miscible in all proportions with water and spirit. It contains an excess of acids. It gives a white precipitate of Chloride with the Nit. Silver, blue with Ferrocyanide, but none with Ferridcyanide of Potassium (no Protochloride). It is turned black by astringent vegetable solutions. Sp. Gr. 1·42 (1·338 by mistake in B. P.) The Peroxide precipitated by Ammonia from a fluid drachm, washed and incinerated, weighs 15·62 gr. (B.)

Action. Uses.—It may be used internally as an astringent tonic, in doses of 5–10 minims diluted with water. Externally, it is a powerful styptic, and may be employed to arrest hæmorrhage; injected into the vessels, it causes coagulation of the blood, and has been thus made use of to cure aneurismal tumours. It is used in pharmacy to make the weaker Solution and Tincture.

LIQUOR FERRI PERCHLORIDI, B. Solution of Perchloride of Iron.

The same strength as Tincture of Perchloride of Iron.

Prep.—Take of *strong solution of Perchloride of Iron*, f℥v.; *Distilled water*, f℥xv. Mix. One-fourth the strength of Liquor Ferri Perchloridi, 1864, which is now called Liq. F. P. fortior.

Dose.—♏x.–♏xxx.

TINCTURA FERRI PERCHLORIDI, B. Tincture of the Perchloride or Sesquichloride of Iron.

Prep.—One part of the strong solution is mixed with three of rectified spirit, and preserved in a stoppered bottle.

The Sp. Gr. is ·992. It is intended to be identical with the L. preparation, about 30 gr. of the Peroxide being precipitated by Ammonia from a fluid ounce. In the L. P. the Tincture was obtained by dissolving the Sesquioxide of Iron in H Cl, and adding Rect. Spirit. It contained then some of the Protochloride, and an excess of H Cl. The latter is not so apt to be the case with the B. Tincture. It gives it a smell of Hydrochloric Ether, in consequence of the acid acting on the Alcohol. The Tincture is of a yellowish-red colour, and its chemical characters are the same as those of the aqueous solution. The Tincture of commerce Mr Phillips found to vary in strength from $9\frac{8}{10}$ to 20 grains of the Peroxide, but, as above prepared, a f℥ contains nearly 30 grains of Peroxide of Iron. The presence of Iron is indicated by its tests. It is necessary to remember that a black inky mixture will be formed with any astringent vegetable preparation. The Chlorine forms a precipitate of Chloride of Silver, when the Nitrate of Silver is added. It is also decomposed by the mucilage of Gum-Arabic. The Perchloride is sometimes dissolved in Hoffman's Liquor, and is then called Teinture de Bestucheff, the old Tinctura Nervina Bestucheff.

Tests.—The strength and purity of this tincture must be ascertained by its correspondence with the above characters, and by the quantity of the Sesquioxide precipitated by Liquor Potassæ = 30 grs.

Inc.—Alkalies, Earths, and their Carbonates; Astringent Vegetables.

Action. Uses.—An active astringent Chalybeate. In Anæmia, &c., in torpid, but not in irritable subjects.

Dose.—♏x.–♏xxx. even ʒj.–ʒij., in some suitable diluent.

[FERRI AMMONIO-CHLORIDUM, L. Ammonio-Chloride of Iron. *Ferrum Ammoniatum.*

This preparation was discovered by Basil Valentine in the 14th century, and has been employed in medicine under various names.

Prop.—It is an orange-coloured powder, formed of small crystallised grains, which have a saline and astringent taste, but with little odour. It is deliquescent, very soluble in both Water and Alcohol, and is considered to be only a mechanical mixture of Sesquichloride of Iron 15 parts, and Hydrochlorate of Ammonia 85 parts. Its nature is recognised by the effects of Potash or caustic Lime in evolving Ammonia, and the Iron and Chlorine will be revealed by their appropriate tests. Mr Phillips has ascertained that it yields about 7 per cent. of Sesquioxide of Iron.

Prep.—L. Digest *Sesquioxide of Iron* ℥iij. in *Hydrochloric acid* Oß, in a proper vessel, in a sand-bath for two hours; add *Hydrochlorate of Ammonia* ℔ijß. first dissolved in *Aq. dest.* Oiij. Strain and evaporate to dryness. Rub the residue to powder.

In the first part of this process a Sesquichloride of Iron is formed. To this the Hydrochlorate of Ammonia being added, the salts become intimately mixed. Mitscherlich has described a definite double salt, of 1 Eq. of Sesquichloride of Iron to 2 of the Hydrochlorate of

Ammonia ($Fe_2Cl_3 + 2\ (NH_3,\ HCl) + 2\ Aq.$), which may possibly exist in this preparation. It is sometimes made by merely mixing these two together in the requisite proportions, dissolving in water, and then evaporating to dryness. It was formerly prepared by sublimation. It is omitted in the B. P.

Tests.—Totally soluble in proof Spirit and in water. Potash throws down Sesquioxide of Iron from the solution (in consequence of the Potassium combining with the Chlorine, and the Oxygen with the Iron), and if added in excess, disengages Ammonia by decomposing the Hydrochlorate of Ammonia.

Inc.—Alkalies and their Carbs., Lime water, Astringent Vegetables.

Action. Uses.—Tonic, &c.

Dose.—Gr. iij.–gr. x. in syrup, or bitter but not astringent extract.

TINCTURA FERRI AMMONIO-CHLORIDI, L. Tincture of Ammonio-chloride of Iron.

Prep.—Dissolve *Ammonio-Chloride of Iron* ℥iv. in *Proof Spirit* and *Dist. water* āā Oß, and filter. (The spirit is thus diluted, in order that the preparation may be entirely dissolved by it.)

This preparation is convenient for internal exhibition. f℥j. contains 5·8 grains of Sesquioxide of Iron (6·8 grains, according to Mr Denham Smith). It is ¼ or ⅕ only of the strength of the Tinct. Ferri Perchlor.

Dose.—fʒj.–fʒij.]

FERRI SULPHURETUM. (B. Appendix.) Sulphuret (or Sulphide) of Iron. Iron Pyrites. *F.* Sulfure de Fer. *G.* Schwefeleisen.

Iron combines with Sulphur in several proportions. It is common in the form of Bisulphuret, of a yellowish colour. It was no doubt known to the ancients.

Prop.—The natural Bisulphuret ($Fe S_2 = 60$) or Iron Pyrites, called also Mundic, is of a colour like Brass, in hard cubical crystals, which are not acted upon by any of the acids except the Nitric. Sp. Gr. 4·98. Often heated for the separation of the Sulphur by sublimation. If moistened and exposed to the air, Oxygen is absorbed, and the Sulphuret converted by degrees into Protosulphate of Iron.

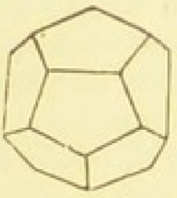
Fig. 24.

The pharmaceutical Sulphuret is a Protosulphuret ($Fe S$). Of the following processes, the first, though inferior, yields a product good enough for pharmaceutic purposes. It dissolves readily in Sul′ and $H Cl$; $H S$ gas is evolved, and Protosulphate of Iron remains in solution. The Protosulphuret consists of $Fe S = 44$, the Sesquisulphuret of $Fe_2 S_3 = 104$, and the Bisulphuret of $Fe S_2 = 60$.

Prep.—Heat *Sublimed Sulphur* part iv. and *Iron-filings* part vij. in a crucible on a common fire till the mass begins to glow. Then remove the crucible, and cover it till the action, which increases considerably, ceases. (Another method.) Take a *rod of Iron*, heat it white hot in a forge, rub it with a *roll of Sulphur* over a deep vessel filled with water to receive the fused globules of Sulphuret. (B.)

By the first process a Protosulphuret is formed. The Iron filings and Sulphur rapidly combine; heat is produced even to redness, and Sulphurous vapours escape: the redness will be maintained, even when the crucible is removed from the fire. It usually contains an excess of Iron. The second process yields a pure product, for which it is essential that the Iron be heated to a full white heat, when, the Iron and Sulphur combining together, bright sparks are emitted, and the melted Sulphuret falls into the water in light brown-coloured globules. Comp. Fe 63·4 + S 36·6 = 100.

Tests.—Nearly soluble in diluted Sul′ with disengagement of Hydrosul′ gas.

Action. Uses.—Antidote against Corrosive Sublimate. Employed as a ready means of obtaining Hydrosul′ gas by the addition of Sul′ or H Cl.

Ferri Sulphas, B. Sulphate of Iron. Sulphate of the Protoxide of Iron. *Ferrum Vitriolatum. Sal Martis. F.* Sulfate de Fer. *G.* Schwefelsaures Eisenoxydul. Eisenvitriol.

Vitriolated Iron, or Green Vitriol, was known to the ancients. It is mentioned in the *Amera Cosha* of the Hindoos (*Hind. Med.* p. 44), and it is used by them, as by the Romans in the time of Pliny, in making Ink. It is found in nature: the Sulphuret, absorbing Oxygen from the atmosphere, is converted into the Sulphate of the Protoxide of Iron; this is apt to be changed again into the red-coloured Sulphate of the Sesquioxide. The Sulphate, being soluble, is found in some mineral waters. It is also made artificially on a large scale for use in the arts by exposing moistened Pyrites to the air, and is called Copperas or Green Vitriol. (By this slow oxidation an excess of Sul′ is produced. This is saturated either by the Alumina contained in Clay, or by the addition of metallic Iron.) The Sulphate of Iron is purified by crystallisation.

Sulphate of Iron ($FeO, SO_3 + 7\,Aq. = 139$) is a transparent crystallised substance of a bluish-green colour, and a styptic (which is also called an inky) taste. The crystals are modifications of the oblique rhombic prism. Sp. Gr. 1·82. They are soluble in a little more than their own weight of cold, and in ¾ of their own weight of boiling water; insoluble in rectified spirit. In the air, they effloresce slightly, and the salt, absorbing Oxygen, is converted into the Persulphate of Iron. Heated, it is first melted in its water of crystallisation; this is afterwards expelled, and the salt reduced to the state of a dry white power (Ferri Sulphas exsiccata). At a still greater heat the acid is expelled, and may be obtained in the form of anhydrous or glacial Sulph′, the latter portion being decomposed. The Iron is left in the

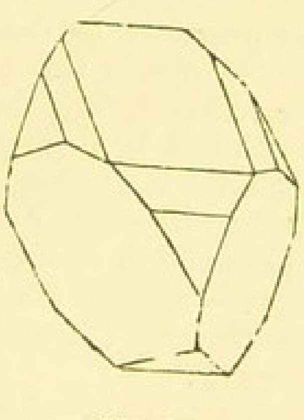
Fig. 25.

state of the reddish-coloured Peroxide, the *colcothar* of old authors. Sulph. Iron is insoluble in Alcohol; its solution in water reddens Litmus; its Iron is precipitated on the addition of alkalies, alkaline earths, and their Carbonates, by the former as a Hydrated Protoxide, and by the latter as a Carbonate, which are both soon changed into the red Peroxide (q. v.) With Ferrocyanide of Potassium, a white precipitate is formed with the pure Sulphate of the Protoxide, but a blue one if the Peroxide be present: the same change of colour ensues when the former precipitate is exposed to the air. The Ferridcyanide of Potassium, or *Red Prussiate of Potash*, forms a blue precipitate with solutions of the Proto-salts of Iron. The solution of Sulph. Iron gives a white precip. with Chlor. Barium. Exposed to the air, it gradually becomes turbid, depositing a reddish-brown sediment of Peroxide of Iron. A black precipitate (Gallate of Iron) is formed when the Sulphate containing any of the Peroxide is added to an infusion or tincture of Galls, or of any other astringent vegetable. Comp. Fe O 25·9 + S′ 28·8 + Aq. 45·3 = 100.

Prep.—B. The commercial sulphate may be purified by dissolving it in water acidulated with Sulphuric acid, and evaporating to form crystals. The B. P. gives a formula for preparing the pure Sulphate by dissolving Iron Wire in dilute Sulphuric acid, and crystallising the product.

Concentrated Sul′ does not act on pure Iron, but the water of the dil. acid becoming decomposed, yields its O to the Iron, while H escapes in the form of gas. The Oxide of Iron formed unites with the Sul′, and the Sulphate of Iron is thus obtained.

Tests.—Pale bluish-green crystals, with little or no efflorescence; entirely soluble in water; this solution does not deposit Copper upon Iron being immersed in it; being first boiled with Nit′, and then precipitated by excess of Ammonia, it yields on filtration a fluid which is colourless or very pale blue. If it be of a deep blue, then Copper is present. (Ammonia precipitates all the Oxide of Iron, but not any Oxide of Copper, if present.) Green Vitriol commonly contains some Persulphate of Iron. Thus the Peroxide may generally be detected in its solution by its appropriate tests. But to obtain the perfect reactions of the Peroxide, which are more characteristic than those of the Protoxide, the solution should be oxidised by boiling with some Nit. Acid. Zinc may be detected by adding Ammonia in excess to the Sesquioxidated solution; after filtering, expel the excess of Ammonia by heat, and any Zinc which is present will be deposited in flakes of the white Oxide.

Inc.—Alkalies and their Carbonates, salts of Calcium and of Barium, Acetate and Diacetate of Lead, Nitrate of Silver, Vegetable Astringents.

Action. Uses.—An irritant and astringent Chalybeate, Emmenagogue.

Dose.—Gr. j.–gr. v. in pills with Bitter Extracts or Aromatic Confection. It may be given with Quinine, Calumba, or Quassia in solution.

Mr Phillips warns from giving it in solution without first boiling the water, and expelling its atmospheric air, of which the Oxygen would peroxidise the Oxide.

Ferri Sulphas exsiccata, B. Dry or Anhydrous Sulphate of Iron.

Prep.—B. Heat in a porcelain capsule to a heat commencing at 212°, which may be finally raised to 400°, until aqueous vapour ceases to be given off. Reduce to a fine powder, and preserve in a stoppered bottle.

Convenient for exhibition in the form of pills. By heat the crystals readily lose six parts of the water of crystallisation, and the dried, therefore, is in this proportion stronger than the common Sulphate of Iron.

Dose.—Gr. ß.–gr. iv.

Ferri Sulphas granulata, B. Granulated Sulphate of Iron.

This is in very minute crystals. It is obtained by pouring a hot concentrated solution of the pure Sulphate into Rectified Spirit, in which the salt is insoluble.

Prep.—B. Pour *Dist. water*, Ojß on *Iron wire*, ℥iv., placed in a porcelain capsule, add *Sulphuric acid*, ℥iv., and when the disengagement of gas has nearly ceased, boil for ten minutes, and then filter the solution into a jar containing *Rect. Spirit*, ℥viij., stirring the mixture so that the salt shall separate in minute granular crystals. Let these, deprived by decantation of adhering liquid, be transferred on filtering paper to porous tiles, and dried by exposure to the atmosphere. They should be preserved in a stoppered bottle.

This form of the Sulphate, introduced from the D. P., is considered elegant, and preferred by some for exhibition internally as less liable to become oxidised. Its reactions, uses, and dose are the same as those of the pure Sulphate of Iron. The Sulphate of Iron may be administered in pills in combination with Aloes or Rhubarb. Forms for such pills were given in the E. P.

A solution of 10 grs. in an ounce of water is used by the B. P. as a test.

Ferri Persulphas. Persulphate, or Sesquisulphate of Iron.

This is a Sulphate of the Peroxide of Iron ($Fe_2 O_3, 3 S O_3$). As the equivalents of the Acid correspond to the equiv. of Oxygen in the base, this salt may be made by adding one equiv. of $S O_3$ and one of Oxygen to two equiv. of the Protosulphate of Iron. The oxidation is effected by means of Nitric acid, $N O_4$ being disengaged. The Persulphate is thus formed by heating the solution of the common Sulphate with Sulph. acid and Nit. acid. When dry, this salt is of a yellowish-brown colour. It is very soluble in water and spirit. Its solution is highly astringent and caustic, of a yellow colour, unchanged in the air, and exhibiting the reactions of the Persalts of Iron. With Sulphate of Potash and Ammonia, this salt (which is isomeric with the Sulphate of Alumina) yields crystalline Salts, having the form and constitution of Alum. The solution of the Persulphate is used in Pharmacy to prepare the other Persalts of Iron.

Liquor Ferri Persulphatis (B. Appendix). Solution of Persulphate of Iron.

A solution of Sp. Gr. 1·441, viscid, dark red, miscible with Alcohol and water, is prepared as above explained.

Prep.—B. Add *Sulphuric acid*, ʒvj. to ℥x. of *Dist. water*, and dissolve *Sulphate of Iron*, ℥viij., in the mixture with the aid of heat. Mix *Nitric acid* ʒvj. with ℥ij. of *Water*, and add the dilute acid to the solution of *Sulphate of Iron*. Concentrate the whole by boiling, until, upon the sudden disengagement of ruddy vapours, the liquid ceases to be black, and acquires a red colour. A drop of the solution is now to be tested with Red Prussiate of Potash, and if a blue precipitate forms, a few additional drops of Nitric acid should be added, and the boiling renewed, in order that the whole of the sulphate may be converted into Persulphate of Iron. When the solution is cold, make the quantity f℥xi. by the addition, if necessary, of Dist. Water.

Sp. Gr. 1·441. Diluted with two volumes of water, this solution gives a white precip. with Chlor. Barium, blue with the Ferrocyanide, but not with the Ferridcyanide (red prussiate) of Potassium (none of the Protosulphate present). If ʒj. be diluted with ℥ij. of water and Solution of Ammonia added in excess, the precipitate ($Fe_2\,O_3$), washed and incinerated, weighs 11·44 grs. (B.) It is used to make the Peroxide, the Potassio-tartrate, Ammonio-citrate, and Quinio-citrate of Iron.

Carburet of Iron. Plumbago, or Graphite.

This, commonly called Black Lead, is usually considered to contain a Carburet of Iron; but as the purest specimens are composed almost entirely of Charcoal, it is treated of with that substance. The specimens containing any notable proportion of Iron must have some of the properties of Ferruginous preparations. Steel, being composed of pure Iron combined with a very small quantity of Carbon, is a true Carburet of Iron.

Ferri Carbonas. Carbonate of Iron. *F.* Carbonate de Fer. *G.* Kohlensaures Eisenoxyd.

The name of Carbonate of Iron long held a place in the Pharmacopœia, but the preparation which was so called in the L. P. is now known under the name of *Ferri Peroxidum*, which, as originally made, contained about 4 per cent. of the Carbonate. The Carbonate of Iron is, however, officinal in the form of *Ferri Carb. Saccharata*, as well as in the *Mistura Ferri Composita* and in the *Pilula Ferri Comp.*

Carbonate of Iron ($Fe\,O, C\,O_2 = 58$) is obtained by precipitating with an alkaline Carbonate a solution of any protosalt of Iron, *e.g.* the Sulphate. A soluble Sulphate of Potash or of Soda is obtained in solution, and an insoluble Carbonate of Iron is precipitated. This is at first of a greenish-white colour, but becomes of a brownish-red colour in the air, and is converted into the Peroxide. (*See* above.) On the supposition that the Protosalts are more efficient as medicines than the Persalts, it has been the practice with many to direct the *Mistura Ferri Composita* to be taken as much as possible when fresh made, or when of a greenish colour. Sugar has long been prescribed with Ferruginous preparations, as in the old *Mars Saccharatus*, and still with the Carbonate of Iron, the Mist. Ferri Comp., Pil. Ferri Comp., and syrups of the Iodide and Phosphate. Soubeiran states that the idea of preventing the oxidation of the Carbonate of Iron, and preserving a uniform medicine, first occurred to Dr Becker, and that it was put into practice by M. Klauer, a Pharmacien of Mulhausen, who employed Sugar for this purpose, having discovered that it had the power of preventing the Protoxide of Iron from passing into the state of Peroxide by absorbing more Oxygen. Experiments have also been made by Drs Clark and Christison, and sugar is employed in preserving the Iodide, Bromide, and Chloride of Iron, as well as Iron-filings.

FERRI CARBONAS SACCHARATA, B. Ferri Carbonas cum Saccharo. Saccharine Carbonate of Iron. Klauer's Ferrum Carbonicum Saccharatum (of the Continent).

Prep.—B. Dissolve *Sulphate of Iron*, ℥ij. and *Carbonate of Ammonia*, ℥j¼ each in half-a-gallon of *Boiling Dist. water*, and mix the two solutions with brisk stirring in a deep cylindrical vessel, which is then to be covered as accurately as possible. Set the mixture by for twenty-four hours, and from the precipitate, which has subsided, separate the supernatant solution by a syphon. Pour on *Boiling Dist. water*, Cj., stir well, and, after subsidence, again remove the clear solution. Collect the resulting carbonate on a calico filter, and, having first subjected it to expression, rub it with *Refined Sugar* ℥j. in a porcelain mortar. Finally dry the mixture at a temperature not exceeding 212°.

In the B. P. 1864 Carbonate of Soda was used as the precipitant.

Tests.—Colour greyish-brown, taste sweet and styptic, easily soluble in H Cl with brisk effervescence. If the Carbonate of Iron is mixed with the Sugar as soon as possible after it is deprived of its water by filtration, it is found that it may then be dried with the heat indicated, without undergoing conversion into the Peroxide of Iron to any great extent. The action of the Sugar in this and other similar cases is, that it prevents oxidation. (Klauer supposed that a definite compound was formed, consisting of Protoxide and Sesquioxide of Iron, Carbonic acid, Sugar, and Water. He found 80 of Protoxide to 20 of Sesquioxide.) Fifty grains ought to yield 7·5 cubic inches of gas when decomposed by an acid.

The B. P. states that the solution in H Cl is but slightly affected by the Ferrocyanide, but gives a copious blue precipitate with the Ferridcyanide of Potassium. It contains at least 57 per cent. of Carbonate, and some Peroxide.

20 gr. dissolved in excess of H Cl, *and diluted with water, continue to precip. Ferridcy. Pot. until at least* 330 *measures of the volumetric Sol. Bichromate of Potash have been added.*

Action. Uses.—Used, as the rest, in Anæmia, and the disorders associated with it. An excellent form of a Ferruginous preparation.

Dose.—Gr. x.–gr. xxx.

PILULA FERRI CARBONATIS, B. Pill of Carbonate of Iron.

Prep.—Saccharated *Carbonate of Iron*, ℥j.; *Confection of Roses*, ℥¼.

This pill is stable in composition, and contains a little less than half its weight of the Protocarbonate of Iron. The compound iron pill of the L. P., made by mixing Sulph. Iron with Carb. Soda, Myrrh, and Treacle, did not contain enough sugar to prevent decomposition.

Dose.—Gr. v. or gr. x.–xxx. 2 or 3 times a-day.

The *Pilules de Vallel* are similar to the pill of the L. P. *Pilules de Blaud* are made with Carb. Potash and Gum-Arabic, and are a close imitation of the following mixture.

MISTURA FERRI COMPOSITA, B. *Compound Mixture of Mars. Griffith's Antihectic or Tonic Mixture.*

Prep.—B. Take of *Sulphate of Iron*, gr. xxv.; *Carbonate of Potash*, gr. xxx.; *Myrrh* and *Refined Sugar* of each, gr. lx.; *Spirit of Nutmeg*, fʒiv.; *Rose Water*, f℥ixß. Reduce the myrrh to powder, add the carbonate of potash and sugar, and triturate them with a small quantity of the rose water so as to form a thin paste; then gradually add more rose water and the spirit of nutmeg, continuing the trituration and further addition of rose water until about f℥viij. of a milky liquid are formed, then add the sulphate of iron dissolved in the remainder of the rose water, mix them together thoroughly, and preserve the mixture as much as possible from contact with the air.

Same strength as the mixture of the L. P. That of B. 1864 contained ⅕th more Sulphate of Iron.

The Sulphate of Iron is decomposed, and Carbonate of Potash being employed, we have a Sulphate of Potash left in solution. A hydrated Protocarbonate of Iron is suspended with Myrrh and the Spirit of Nutmeg as aromatics, while the Sugar assists in preventing the formation of Peroxide of Iron. Mr Brande states that the best mode of making it is to triturate a fine piece of Myrrh into an emulsion with rose water, add the Carbonate of Potash, Nutmeg, and Sugar, and lastly dissolve in it the Sulphate of Iron. If the bottle is kept full, the preparation will long remain unchanged: it should therefore be prescribed in draughts. (Ince, P. J. i. 252.)

Inc.—Acids and Acidulous Salts, Vegetable Astringents.

Dose.—f℥j.–f℥ij. 2 or 3 times a-day.

Soubeiran (ii. p. 434) describes some other preparations of the Carbonate of Iron, as the *Poudre Ferrugineuse*, in which Bicarb. Soda and Sulphate of Iron are mixed with Sugar, also *Poudre Ferée Gazeuse*. The latter is prepared as follows:—

Prep.—Mix *Ferri Sulph.* gr. iij. carefully with pounded *Sugar* ʒijß; add *Bicarb. Soda* in powder grs. liv., and coarsely pounded *Tartaric* ʒj.—add to a bottle of water, cork it immediately, and agitate.

A sweetish acidulous preparation of Iron, made agreeable by the effervescence of the Carbonic acid. The Iron may be increased, as the 3 grs. of the Sulphate will produce 1¼ gr. of the Carbonate of Iron.

The *Aqua Chalybeata* of Bewley and Evans is also an elegant and agreeable preparation of this metal. (*See* Citrate of Iron.)

Liquor Ferri Pernitratis, B. Solution of Pernitrate of Iron.

Prep.—B. Dilute *Nitric acid*, ℥ivß with ℥xvj. of *Dist. water*, introduce *fine Iron Wire*, free from rust, ℥j. into the mixture, and leave them in contact until the metal is dissolved, taking care to moderate the action, should it become too violent, by the addition of a little more Distilled water. Filter the solution, and add to it as much Distilled water as will make its bulk one pint and a half.

Prop.—This is a solution of the Pernitrate of Iron ($Fe_2\ O_3$, $3\ NO_5 = 242$) of Sp. Gr. 1·107. Being a preparation of the Peroxide, it so far resembles the Tinct. Ferri Perchlor. In the preparation, part of the $N\ O_5$ is spent in oxidising the Iron; another part combines with the Peroxide formed.

The solution is clear, and of a reddish-brown colour, slightly acid and astringent. It gives a blue precipitate with the Ferrocyanide, but none with the Ferridcyanide of Potassium. If placed in a test tube with half its volume of pure Sulphuric acid, and a solution of Sulph. Iron poured on, it assumes a dark colour from the formation of the Persulphate of Iron. Precipitated with excess of Ammonia, ʒj. yields a precipitate, which, when washed, dried, and incinerated, weighs 2·6 grains. (B.)

Action. Uses.—It is an active Chalybeate, astringent and corrosive, resembling the Perchloride. It is said to be very efficient. The B. P. has adopted it from the D. P.

Dose.—f ʒß–ʒj., diluted with water, or infusion of Quassia or Calumba.

Tinctura Ferri Acetatis, B. Tincture of Acetate of Iron.

Prep.—B. Take of solution of *Persulphate of Iron*, f℥ijß; *Acetate of Potash*, ℥ij.; *Rectified Spirit*, a sufficiency. Dissolve the acetate of potash in f℥x., and add the persulphate of iron to f℥viii. of the spirit, then mix the two solutions in a two-pint bottle and shake them well together, repeating the agitation several times during an hour. Put the tincture, with the precipitated salt contained in it, upon a filter, and when the liquid has ceased to run through, put as much rectified spirit upon the filter as will make the filtered product measure one pint.

A good Chalybeate, introduced (1867) from the old D. P. It contains the Peracetate of Iron, and its reactions are those of the Peroxide and Acetic acid.

Dose.—♏v.–♏xxx.

Ferri Phosphas, B. Phosphate of Iron. *Blue Phosphate of Iron.*

This is a salt of the Protoxide, but is apt to become partially oxidised in keeping. It has the composition ($3\ Fe\ O$, $P\ O_5$). As Phosphoric acid is a tribasic acid, this is a neutral salt. There are many other Phosphates of Iron, some of which have been used in medicine. This, which is known as the Blue Phosphate, was first prescribed by Dr Prout, and is now introduced into the B. P. The B. P. describes it as "partially oxidated." It is a slate-blue, amorphous powder, insoluble in water, soluble in Hydrochlor. acid.

The solution gives an abundant blue precipitate with the Ferridcyanide, and generally a slight one with the Ferrocyanide of Potassium, on account of the presence of some peroxide. The presence of Phosphoric acid is recognised by treating it with Tartaric acid and excess of Ammonia, and then with solution of the Ammonio-sulphate of Magnesia, when a crystalline precipitate of the triple Phosphate is thrown down.

Prep.—B. Dissolve *Sulphate of Iron*, ℥iij., in *boiling Dist. water*, Oij., and *Phosphate of Soda*, ℥ijß, with *Acetate of Soda*, ℥j., in *boiling Dist. water*, Oij. Mix the two solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with hot distilled water, till the filtrate ceases to give a precipitate with Chloride of Barium. Finally, dry on porous bricks in a stove whose temperature does not exceed 100°. Preserve the dried salt in a stoppered bottle.

The Phosphate of Soda (q. v.) contains 2 Equiv. of the Alkali with one of basic water. If added by itself to the solution of Sulph. Iron, an iron salt of similar composition is precipitated ($2\,Fe\,O, H\,O, P\,O_5$). This salt is white, but becomes blue on exposure. When the Acetate of Soda is added with the Phosphate, the precipitate is found to contain another Equiv. of Protoxide of Iron, the Soda of the Acetate combining with the equivalent of Sulphuric acid which is in excess. Thus—

$$3\,(Fe\,O,\,S\,O_3) + 2\,(Na\,O),\,H\,O,\,P\,O_5 + Na\,O,\,\bar{A} =$$
$$3\,Fe\,O,\,P\,O_5 + 3\,(Na\,O,\,S\,O_3) + \bar{A} + H\,O.$$

There is some doubt, however, about the constitution of the Phosphate of Iron. According to Kane, the blue phosphate formed as above is a definite compound of the Protophosphate with the Perphosphate. But Gmelin has found the native phosphate, which it strongly resembles, to have the composition ($3\,Fe\,O,\,P\,O_5 + 8$ Aq.)

Tests.—The qualitative tests have already been mentioned. Arsenic may be present as an impurity. If digested in H Cl with a lamina of pure copper, a dark film forms on it when Arsenic is present.

"20 *gr. dissolved in* H Cl, *continue to give a blue precip. with red prussiate of potash, until* 250 *gr. of volumetric sol. Bichrom. Potash have been added.*" (B.)

Action. Uses.—It is a mild Chalybeate, not very active, on account of its insolubility, but supposed to be easily assimilated. Dr Prout used it in Diabetes. The presence of Phosphoric acid with the Iron has caused it to be recommended, on theoretical grounds, in Rickets, Scrofula, and Nervous disorders.

Dose.—Gr. v.–gr. x. In combination with Phosphoric acid, which enables it to dissolve in water, it may be given in the following syrup, formulæ for which had been published (as well as of other similar preparations) previously to the issue of the B. P. 1864.

SYRIPUS FERRI PHOSPHATIS, B. Syrup of Phosphate of Iron.

Prep.—B. Dissolve *granulated Sulphate of Iron*, gr. ccxxiv. in ℥iv. of *Dist. water*, *Phosphate of Soda*, gr. cc., and *Acetate of Soda*, gr. lxxiv. in ℥iv. more;

mix the two solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with *Distilled water* till the filtrate ceases to be affected by Chloride of Barium. Then press the precipitate strongly between folds of bibulous paper, and add to it *Dilute Phosphoric acid*, ℥vß. As soon as the precipitate is dissolved, filter the solution, add *Refined Sugar* ℥viij., and dissolve without heat. The product should measure exactly f℥xij.

Here the blue phosphate is formed as above, but the addition of the Phosphoric acid converts it into a Superphosphate, which is soluble in water. A large portion of the acid remains in excess. It has a strong acid taste. Each drachm contains gr. j. of the salt, and nearly ʒß of the dilute acid. The process is that of Gale. (P. J. 2d series, i. 497.)

Dose.—ʒß–ʒj. For children the dose must be much smaller. It must be freely diluted on account of the large proportion of acid present. (Messrs Savory and Moore have published a formula for this Syrup, with only ♏xvj. of Dil. acid in ʒj., which would be far better.)

POTASSÆ PRUSSIAS FLAVA, B. Yellow Prussiate of Potash. Potassii Ferrocyanidum. Ferrocyanide of Potassium. *F.* Cyanure de Fer et de Potassium. *G.* Cyaneisen Kalium. Blausaures Eisenkali.

This salt is officinal for the purpose of making Diluted Hydrocyanic acid. It is also used as a test for Persalts of Iron. It is found in a very pure state in commerce. (Formula $Fe\,Cy_3, K_2 + 3\,Aq. = 211.$)

Prop.—This salt is of a lemon-yellow colour, and transparent, without smell, but having a cooling saline taste. The crystals are large and quadrangular, with more or less truncated edges and angles, derived from a primary octohedron; tough and flexible; Sp. Gr. 1·83. Soluble in 4 parts of cold and 2 of boiling water; insoluble in Alcohol. Heated to 212°, they lose about 13 per cent. or their 3 Eq. of water of crystallisation, and are reduced to a white powder. At a red heat they are decomposed, Nitrogen escapes, Carburet of Iron and Cyanide of Potassium are left; but if exposed to the air, the latter absorbs Oxygen, and becomes Cyanate of Potash. This salt is not precipitated by the alkalies, nor by Sulphuretted Hydrogen, nor by Tincture of Galls, proving that the Iron is in a peculiar state of combination. With salts of the Peroxide of Iron, it produces precipitates of Prussian Blue, but white precipitates with salts of the Protoxide, which become blue after exposure to the air. With Lead, Zinc, Copper, &c., it forms different-coloured precipitates, and therefore serves to ascertain the presence of these metals. Heated with diluted Sul′, Hydrocy′ is produced. If boiled with Binoxide of Mercury, Bicyanide of the metal is obtained in solution.

This salt is considered by some to be composed of 1 Eq. of Cyanide of Iron united with 2 of Cyanide of Potassium. But the view of Liebig is now most generally adopted, being sustained by analogy, and by its known properties. The Iron in it forms part of a supposed radical ($Fe\,Cy_3$), called Ferrocyanogen, and is not precipitable by tests. This radical is bibasic, and is united in this salt with 2 Eq. of Potassium.

This salt is prepared on a large scale by calcining animal matter, such as hoofs, chippings of horn, dried blood, pieces of hides, cellular membrane, the refuse of tallow melters, with Carb. Potash, in an iron pot with iron stirrers; the result is then thrown into water, dissolved, filtered, evaporated, and crystallised until pure.

Tests.—Totally dissolved by water. A gentle heat evaporates 12·6 parts from 100 parts. It slightly (if at all) alters the colour of Turmeric. What it throws down from the preparations of Peroxide of Iron is blue, and that from the preparations of Zinc is white. What is thrown down from a solution of Sulphate of Iron is first white, and then blue; from a solution of Sulphate of Copper, brown. When burnt, the residue dissolved by H Cl is again thrown down by Ammonia: 18·7 parts of Peroxide of Iron are yielded by 100 parts.

Action. Uses.—Sedative; but possessed of little activity; is rapidly absorbed and diffused through the secretions.

¼ oz. in 5 oz. Dist. water forms the test solution of the B. P.

Dose.—Gr. x.–gr. xv.; but may be given in much larger doses.

POTASSÆ PRUSSIAS RUBRA, B. Appendix. Ferridcyanide of Potassium. Red Prussiate of Potash.

K_3, $Fe_2\,Cy_6$. It consists of another radical, called Ferridcyanogen, in combination with Potassium. It resembles the Yellow Prussiate in many of its properties, but with this important difference, that it gives a blue precipitate with the Protosalts, and none with the Persalts of Iron. It is thus used as a test to distinguish between them.

Prep.—By passing Chlorine gas through a solution of the Ferrocyanide, 1 Eq. of Potassium is removed from 2 Eq. of the salt, and the Ferridcyanide formed.

It forms anhydrous rhombic prisms of a ruby-red colour, soluble in 4 parts of water. One quarter of an ounce in five ounces forms the test solution of the B. P.

FERRI SESQUIFERROCYANIDUM. Sesquiferrocyanide of Iron, (*Graham.*) *Percyanide of Iron. Ferri Ferrocyanas,* U.S. Prussian Blue. *Ferro-prussiate of Iron. F.* Bleu de Prusse. *G.* Cyaneisen Berlinerblau.

This substance, so well known by the name of Prussian Blue, was discovered in 1710 by Diesbach, a preparer of colours at Berlin.

Prussian Blue may be obtained perfectly pure, on a small scale, by double decomposition between Ferrocyanide of Potassium and an acid solution of Persulphate or Perchloride of Iron. In the arts it is made by calcining Potash and animal matter, adding this to 12 or 15 times its weight of water, and precipitating the clear solution obtained with 2 parts of Alum and 1 of the Protosulphate of Iron. It is not now officinal; but it is interesting in being the result of one of the tests for Hydrocyanic acid.

Berzelius, who ignored the existence of Ferrocyanogen, considered it a compound of 2 Eq. of the Sesquicyanide of Iron with 3 of the Protocyanide. ($2\ Fe_2\,Cy_3 + 3\ Fe\,Cy$.) Again, it consists ultimately of $Fe_7\,Cy_9$, and has thus been called a Percyanide of Iron. But, adopting the view of Liebig, it appears to be a Sesquiferrocyanide, not in the proportions of 2 to 3, but of 4 to 3, for the reason that the radical Ferrocyanogen is *bibasic*. ($4\ Fe + 3\ Fe\,Cy_3 = 430$.)

[The test for Hydrocyanic' is this. To an old solution of Sulphate of Iron (which contains some Persulphate), first supersaturated with caust. Potash, the suspected fluid is added. Then, with the Potash and Protosulphate, the H Cy produces Ferrocyanide of Potassium and some Sulphate of Potash ; thus,

$$Fe\,O,\ S\,O_3 + 3\ K\,O + 3\ H\,Cy = K_2,\ Fe\,Cy_3 + K\,O,\ S\,O_3 + 3\ H\,O.$$

The Ferrocy. Pot. next immediately reacts on the Persulphate of Iron in the solution, and precipitates Prussian Blue.

$$3\ (K_2,\ Fe\,Cy_3) + 2\ (Fe_2\,O_3,\ 3\ S\,O_3) = (4\ Fe + 3\ Fe\,Cy_3) + 6\ K\,O,\ S\,O_3.$$

On the addition of dilute $S\,O_3$, any Oxide of Iron precipitated will be dissolved ; but the blue colour is unaffected. This test is important and characteristic.]

FERRUM TARTARATUM, B. Ferri Potassio Tartras, L. Potassio-Tartrate of Iron. Tartrate of Potash and Iron. Tartarised Iron, and Chalybeated Tartar. Potassæ Ferro-Tartras. *F.* Tartrate de Potasse et de Fer. *G.* Eisenweinstein.

Prop.—The Tartrate of Potash and Iron ($Fe_2\,O_3,\ K\,O,\ C_8\,H_4\,O_{10} + H\,O$) is a powder of an olive-brown colour, without odour, and of a mild chalybeate taste. It is usually prepared in shining brittle scales of a deep garnet colour. Exposed to moist air, it deliquesces ; it is soluble in 4 times its weight of water ; slightly in Alcohol, more so in Wine. The solution is of a light-brownish colour, and remains unchanged for a considerable time. It is remarkable for not being decomposed by Ammonia or its Carbonate at any temperature, nor by the other alkalies or their Carbonates without the aid of heat. It is also unaffected by the Ferrocyanide of Potassium until a few drops of the stronger acids are added, when a deep blue colour is produced, showing that decomposition must have taken place. In these reactions it resembles the Ferrocyanides, and is thus supposed, like them, to contain Iron *in the acid part* (*Potassæ Ferro-Tartras*, Pereira). Vegetable astringents cause the usual black precipitate. The salt consists of 1 Eq. of Tartaric acid (which is bibasic), combined with 1 Eq. of Potash and 1 of the Peroxide of Iron. As Mr Phillips considered Tartaric acid to be ($C_4\,H_2\,O_5$), according to him 1 Eq. of the salt contained 2 Eq. of the acid.

The Tartarated Iron of the B. P. closely resembles the Potassio-tartrate of the L. P., but it is directed to be prepared in scales, while the other might be made either in powder or in scales. In the present formula the Peroxide of Iron is obtained directly from the Solution of the Persulphate, and precipitated by Ammonia, as in the L. P.

Prep.—B. Mix *solution of Ammonia* ℥x. with *Distilled water* Oiij., and to this add gradually *solution of Persulphate of Iron* ℥vß, previously diluted with *Distilled water* Oij., stirring constantly and briskly. Let the mixture stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with Distilled water until that which passes through the filter ceases to give a precipitate with Chloride of Barium. Mix the washed and drained precipitate intimately with *Acid Tartrate of Potash* in powder ℥ij. in a porcelain dish, and let the mixture stand for twenty-four hours; then, having applied a gentle heat, not exceeding 140°, add gradually *Distilled water* Oj., and stir constantly until nothing more will dissolve. Filter; evaporate at a temperature not exceeding 140° to the consistence of syrup, and dry it in thin layers on flat porcelain or glass plates in a drying closet at 120°. Remove the dry salt in flakes, and keep it in stoppered bottles.

The B. P. 1864 used less of the solution of the Persulphate, and employed Soda as a precipitant.

1 Eq. of the Peroxide of Iron (80) is taken into the composition of the Supertartrate of Potash ($K O, C_8 H_4 O_{10}, H O = 188$), taking the place in it of the equivalent of water. So that an acid salt becomes now converted into a neutral salt. The B. P. carefully enjoins that the heat used in the process shall not exceed 140°, as else some portion of the salt may be converted into an insoluble Peroxide. It is objected by manufacturing chemists that at this temperature it is difficult or impossible to prepare the scales at all. (P. J., and "Lancet," 1864.)

The preparation is not always the same. The atomic proportions would be certain to produce a pure salt, but in the "scaling" process it may be again decomposed to some extent. The analysis of Soubeiran, and more lately that of Mr Bastick (P. J.), indicate the formula for this salt which is given above.

Tests.—The aqueous solution, acidulated with Hydrochloric acid, gives a copious blue precipitate with the Ferrocyanide of Potassium, but no precipitate with the Ferridcyanide. When the salt is boiled with solution of soda, peroxide of iron separates, but no Ammonia is evolved, and the filtered solution, when slightly acidulated by Hydrochloric acid, gives, as it cools, a crystalline deposit (Bitart. Potash.)

By incinerating fifty grains at a red heat, washing what is left, and again incinerating, a residue of Peroxide of Iron is left, weighing 15 grains. B. P.

Inc.—Strong acids, Lime water, Acetate of Lead, Hydrosulphuric′, Vegetable Astringents.

Action. Uses.—Chalybeate Tonic, mild in taste, soluble and efficient. In Anæmia, Amenorrhœa, Hysteria, Scrofula, Cancer.

Dose.—Gr. x.–gr. xxx. in pill, or in solution with some aromatic.

VINUM FERRI, B. Steel Wine. Wine of Tartarated Iron.

Prep.—B. Take of *fine Iron Wire* (about No. 35) ℥i.; *Sherry*, Oj. Macerate for thirty days in a closed vessel, the iron being almost, but not quite, wholly immersed in the wine, and the vessel frequently shaken, and the stopper removed; then filter.

(Similar to the process of the L. P., which is now restored.) Twice as strong as that of L. P. 1851.

B. (1864.) Dissolve *Tartarated Iron* gr. clx. in *Sherry* Oj.

As a perfect solution of uniform strength, this latter is preferable to the old Steel Wine, prepared by digesting Iron Filings or Iron Wire in Wine for several weeks. A portion of the Iron becomes peroxidised and is dissolved by any Bitart. Potash, or free vegetable acid present in the Wine, being taken up as Potassio-tartrate, Malate, or Acetate, of the Peroxide of Iron. The quantity of Iron dissolved is nearly in inverse ratio to the quality of the Wine. Thus, Cape Wine dissolves much more than good (dry) Sherry. Hock has been recommended for use on account of its acidity. Many manufacturers have been in the habit of securing a uniform product by a process similar to that of the B. P. (1864).

The Steel Wine of 1864 contains 8 grains in the ounce, 1 gr. in the drachm, of the Potassio-tartrate of Iron. It is thus stronger than the Steel Wine of 1867, which, when prepared according to the directions given, will contain generally an amount of Peroxide of Iron corresponding to six grains of the salt in each ounce. The Wine of the L. P. was only half as strong as that of B. P. 1867.

Action. Uses.—An admirable Chalybeate stimulant, much used for children and young people.

Dose.—ʒj.–℥ß or more, according to age.

MISTURA FERRI AROMATICA, B. Aromatic Mixture of Iron.

Take of *Pale Cinchona Bark* in powder, ℥j.; *Calumba Root* in coarse powder, ℥ß; *Cloves* bruised, ℥¼; *Fine Iron Wire*, ℥ß; *Compound Tincture of Cardamoms*, f℥iij.; *Tincture of Orange Peel*, f℥ß; *Peppermint water*, a sufficiency. Macerate the Cinchona Bark, Calumba Root, Cloves, and Iron, with f℥xij. of the Peppermint water, in a closed vessel for three days, agitating occasionally; then filter the liquid, adding as much Peppermint water to the filter as will make the product measure f℥xijß; to this add the tinctures, and preserve the mixture in a well-stoppered bottle.

Introduced in 1867, from the old D. P. The Iron becomes partially oxidised, and dissolves in the acids of the tinctures.

Dose.—f℥j.–f℥ij.

FERRI ET AMMONIÆ TARTRAS. Ammonio-Tartrate of Iron.

In the same way that Sulphate of Alumina, by combining with the Sulphates of Potash, Soda, or Ammonia, will form either Potash, Soda, or Ammonia Alum, so various double salts may be formed by presenting different bases with Iron to the Citric and Tartaric acids. The Ammonio-Tartrate of Iron is one of these, which has for some time been prepared as a substitute for the Tartrate of Potash and Iron. It is of a dark-brown colour, in brilliant scales or in angular grains, resembling Kino; its powder is of a brown colour, like Iron-rust. It has a mild ferruginous taste; is soluble in rather more than its weight of Water at 60°; not decomposed by boiling water; insoluble in both Alcohol and Ether. It is composed of 1 Eq. of Tartaric acid, 1 of the Peroxide of Iron, 1 of Ammonia, and 4 of water. A formula for preparing it was given by Mr Proctor, jun., in Amer. J. of Pharm., by decomposing Supertartrate of Ammonia with fresh-made Hydrated Peroxide of Iron. (*See* P. J. i. 291.) It is an eligible preparation of Iron, and may be given in doses of gr. iij. to gr. viij. in aqueous solution, in pill, or with some confection.

FERRI CITRAS. Citrate of Iron.

M. Beral, in 1831, introduced to the notice of the profession several preparations in which Iron is combined with Citric acid. Of these the Citrate of the Peroxide of Iron is made by mixing a boiling solution of Cit′ ℥iv. in Aq. Dist. ℥xvj. with moist *Hydrated Sesquioxide of Iron* about ℥viij. It is obtained (by drying its solution spread out on glass) in thin and transparent laminæ of a beautiful garnet hue; has an acid and not disagreeable styptic taste. It dissolves slowly in cold water, but more readily in boiling water. M. Beral has proposed a Protocitrate of Iron, which is white and pulverulent, with a strong chalybeate taste, and also a Citrate of the Magnetic Oxide of Iron. But the name *Citrate of Iron* is most generally applied to a preparation in which the excess of acid has been counteracted by Ammonia, and which thus becomes converted into the following:—

FERRI ET AMMONIÆ CITRAS, B. Ammonio-Citrate of Iron. *Ferric Citrate of Ammonia.*

This elegant chalybeate has been long in use, and a formula for preparing it was first introduced in the P. L. of 1851.

Citric acid ($C_{12}\,H_5\,O_{11}$) is tribasic—*i.e.*, it requires for its neutralisation 3 Eq. of a base. There is some doubt as to the composition of this salt. According to one view, it consists of an equivalent of the neutral Citrate of Ammonia ($3\,N\,H_4\,O, \overline{Ci}$) combined with an equivalent of the neutral Citrate of the Peroxide of Iron ($3\,Fe_2\,O_3, \overline{Ci}$). According to the B. P. (1864) the Citric acid is in excess, and the salt consists of a Citrate of Ammonia, Water, and Perox. Iron, the water being basic. The B. P. (1864) gives the formula—

$$(Fe_2\,O_3, N\,H_4\,O, H\,O, C_{12}H_5O_{11} + 2\,H\,O).$$

Prop.—As prepared below, it is in beautiful shining translucent scales of a hyacinth-red colour, with tinge of olive-green. It is very soluble in water; the solution is neutral or feebly reddens Litmus; its taste at first sweet, and then astringent. It is almost insoluble in Alcohol. The aqueous solution (like that of the Potassio-Tartrate) is not precipitated by Ammonia, nor by Ferrocyanide of Potassium, unless an acid be first added, when a blue precipitate falls. Mr Phillips considers that the salt varies slightly in composition.

Prep.—Mix f℥xiv. of *Solution of Ammonia* with *Distilled water* Oij., and to this add gradually *Solution of Persulphate of Iron* ℥viij., previously diluted with *Distilled water* Oij., stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally; then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water until that which passes through the filter ceases to give a precipitate with Chloride of Barium. Dissolve *Citric acid* ℥iv. in ℥viij. of *Distilled water*, and having applied the heat of a water-bath, add the *Oxide of Iron*, previously well drained, and stir them together until the whole, or nearly the whole, of the oxide has dissolved. Let the solution cool, then add of *Solution of Ammonia* ℥v½. Filter through flannel; evaporate to the consistence of syrup, and dry it in thin layers on flat porcelain or glass plates at a temperature not exceeding 100°. Remove the dry salt in flakes, and keep it in a stoppered bottle. (Similar to 1864.)

In the first part of the process a moist Peroxide of Iron is prepared. This, when heated with the solution of Citric acid, is dissolved, forming an acid Citrate of the Perox. Iron ($Fe_2\,O_3, 2H\,O, \overline{Ci}$). On adding Ammonia to neutralisation (f℥vß), it takes the place of one equivalent of the basic water, forming the salt, the formula of which is given above. The heat used in drying is scarcely sufficient in practice, but a higher temperature is apt to drive off some of the Ammonia, and decompose the Citric acid. In the mode of preparation adopted by the L. P., which prepared the Sesquioxide by exposing the moist Carbonate of Iron to the air, a salt was obtained containing some Protocitrate of Iron, from a part of the Carbonate having remained unoxidised.

Tests.—B. Heated with Solution of Soda, it evolves Ammonia, and deposits Peroxide of Iron. The alkaline solution from which the iron has separated, when slightly supersaturated with H Cl, does not let fall a crystalline precipitate (Bitart. Potash). This is a test for Tartaric acid. The solution of this salt acidulated with H Cl, gives a copious blue precip. with Ferrocy. Pot., but none with the Ferridcyanide (no protosalt). Incinerated with exposure to air, it leaves 26·5 per cent. of Perox. Iron.

Inc.—Liquor Potassæ. Liquor Sodæ. Strong Acids.

Action. Uses.—It is a mild preparation, pleasant to the taste, and useful for children and weak persons; may also be given with Ammonia or the Alkaline Carbonates. It is neither irritant nor astringent.

Dose.—Gr. v.–gr. x.

Double Citrates of Iron, with Zinc, Soda, Potash, and Magnesia, are sometimes prepared. (For Ferri et Quiniæ Citras, B., *Citrate of Quinine and Iron*, see *Cinchona.*)

Vinum Ferri Citratis, B. Wine of Citrate of Iron.

Prep.—B. Take of *Citrate of Iron and Ammonia*, gr. clx.; *Orange Wine*, Oj. Dissolve, and let the solution remain for three days in a closed vessel, shaking it occasionally; afterwards filter.

Introduced in 1867.

Dose.—fʒj.–fʒiv.

Aqua Chalybeata.—One of the most elegant and agreeable forms which has yet been proposed for the exhibition of Iron is an effervescing solution of Citrate of Iron flavoured with Orange-peel, called *Aqua Chalybeata* by Messrs Bewley and Evans, and for which the name of Chalybeate Champagne has been proposed. It has been examined and reported upon by Dr Ure and by Mr Brande. It consists of a solution of Citrate of Iron highly charged with Carbonic acid gas, and flavoured with Orange-peel. It is sent out in six-ounce bottles, which afford on analysis gr. vij$\frac{9}{10}$ of Peroxide of Iron, corresponding to gr. xiijß of the Citrate of Iron. Two ounces, or a wine-glass full, 2 or 3 times a-day, forms a dose which is grateful to the taste, and suitable to the most delicate in constitution, and to children, at the same time that it is effective as a tonic.

LACTATE OF IRON. FERRI LACTAS. Lactate of the Protoxide of Iron is a mild chalybeate, which is obtained in a greenish-white powder, or in greenish acicular crystals, by the direct action of a dilute solution of Lactic acid on Iron-filings. When it is dissolved, the Iron passes to a higher state of oxidation, and the solution becomes yellow. It has also been made by decomposing Protosulph. Iron with Lactate of Lime. It may be prescribed in the form of Lozenges or of Syrup. It has been extensively used in France, and is no doubt an admirable form of exhibiting Iron.

MALATE OF IRON is a form of preparation in use in the Prussian Pharmacopœia. It is procured by digesting one part of Iron nails or wire along with 4 parts of Apple-juice for some days, then evaporating the liquid to one-half, filtering and concentrating to the consistence of an extract.

FERRI ARSENIAS, B. Arseniate of Iron will be best considered among the compounds of Arsenic. (q. v.)

The *Sulphate of Potash and Perox. Iron, or* IRON ALUM, containing Fe_2 O_3, instead of the Al_2 O_3 in common Alum, has been found by Dr Tyler Smith to act as a powerful astringent.

FERRI VALERIANAS. Valerianate of Iron. This is a reddish-brown coarse powder, with a peculiar smell, which, however, is not quite that of Oil of Valerian. It is insoluble in water, but soluble in Alcohol, in which it may be given. On the application of heat, or when it is dissolved in H Cl, Valerianic acid is set free.

Prep.—A solution of *Persulphate of Iron* is precipitated by a solution of *Valerianate of Soda.* The precipitate is washed on a filter, dried, and kept in a well-stoppered bottle.

This preparation was introduced in the D. P. of 1850, but is now omitted from the Pharmacopœia.

Citrate of Iron flavoured with Oil of Valerian has been frequently substituted for it, but may easily be detected by its solubility in water. (P. J. viii. 577.)

Use.—It is sometimes administered in Amenorrhœa, or in Anæmia combined with nervous disorder.

Dose.—Gr. ß–gr. j. 3 times a-day. (*See* Sodæ Valerianas.)

ZINCUM, B.

Zinc. *F.* Zinc. *G.* Zink.

Zinc is considered to have been known as a distinct metal only since the the time of Paracelsus. It has long been imported from China into India. The name *Tutenague*, by which Chinese Zinc was known in commerce, is evidently derived from the Tamul, *tutanagum* (Essay Hind. Med. p. 100), and it was at one time called Indian Tin (*Stannum Indicum*). The ores of Zinc were no doubt employed by the ancients in making brass.

Zinc (Zn=32·5) is found in the state of an Oxide, but principally as a Sulphuret (*Blende*), and an impure Carbonate (*Calamine*). From both ores it is first converted into an Oxide by the process of roasting, and then reduced to the metallic form by the aid of Carbonaceous matter, when it may either be fused or sublimed. Until purified by a second distillation, it contains as impurities small portions of other metals, as Iron, Copper, Arsenic, &c.

Prop.—Zinc is white, with a shade of blue, and of considerable brilliancy. Sp. Gr. from 6·8 to 7·2. At ordinary temperatures it has little ductility or malleability, but is hard and tough. When heated from 210° to 300° it becomes ductile, and may be drawn into wire or beaten or rolled into thin sheets, which may also be done at ordinary temperatures if it be very pure. At 400° it becomes brittle, and may be powdered. It melts at 773°, and, on slowly cooling, crystallises in four-sided prisms, with its fracture displaying a lamellated structure. At a white heat it may be volatilised in close vessels; but in contact with the air, it burns vividly, diffusing white fumes of Oxide. Exposed to the air, or kept under water, Zinc becomes covered with a thin film of Suboxide, which protects it.

ZINCUM GRANULATUM, B. Granulated Zinc.

The B. P. makes use of Zinc in the granulated state, obtained by fusing it, and pouring it into cold water.

Tests.—Almost entirely dissolved by diluted Sulphuric acid. This solution is free from colour, and has the other characters of the Sulphate of Zinc. (q. v.)

The presence of Sulphur or of Arsenic may be detected by testing the Hydrogen gas given off during the solution of the metal in Sulph. acid. If this contains Sulphuretted Hydrogen, it will blacken a piece of paper moistened with a solution of Acetate of Lead; if Arseniuretted Hydrogen, the gas, when ignited, will blacken a piece of white porcelain held low down in the flame. (B.)

Action and Uses of the Zinc Compounds.—Metallic Zinc is not used in medicine. The Oxide and Carbonate of Zinc are both valuable for external use as absorbent and desiccant powders, for dusting over sores, burns, excoriations, and ulcers. Both are used to form cooling ointments, which are extensively employed. The sulphate is a soluble crystalline salt. Its solution is corrosive, or astringent when properly diluted. It is much employed to form Collyria, Gargles, Injections, and Lotions.

Internally it is also Astringent and Antispasmodic, as in Epilepsy, Hysteria, and Gonorrhœa. In large dose it constitutes a speedy and safe emetic, being thus of value in many cases of poisoning. The Acetate of Zinc is like the Sulphate, but milder. The Valerianate has been recommended as an Antispasmodic. The Chloride, which has a strong affinity for water, is a powerful caustic, and sometimes applied externally in cases of Lupus or Cancer. It is used to form "Burnett's Solution," largely employed as a disinfecting and deodorising agent.

ZINCI OXIDUM, B.

Oxide of Zinc. *Lana philosophica. Flores Zinci. F.* Oxide de Zinc. *G.* Zinkoxyd.

This Oxide has been long known, in an impure state, by the name of *tutty*, which appears to be of Oriental origin, as the Sulphate is still called *suffed tutia*, or white tutia; the Sulphates of Iron and Copper being called *green* and *blue tutia*. (Hindoo Med. p. 100.) So great is the affinity of Zinc for Oxygen, that it precipitates many other metallic oxides, when in solution, in the form of their respective metals.

Prop.—Oxide of Zinc ($Zn\,O$), when pure, forms a light flocculent powder of a white colour, devoid of taste and smell, insoluble in water or alcohol, but soluble in acids and in the caustic fixed alkalies. When heated to a low red heat, it acquires a yellow colour, which disappears again when it cools, unless Iron be present. At a low white heat it may be melted, and when this is increased it is volatilised. It is thrown down in a hydrated form, when an alkali is added to a solution of a salt of Zinc. When pure, its neutral solutions in acids throw down a white precipitate on the addition of Sulphuretted Hydrogen or Ferrocyanide of Potassium, but $H\,S$ causes no precipitate in an acid solution. The officinal Oxide, made by burning the Carbonate, is anhydrous, and insoluble in Ammonia. The Oxide made by precipitation is hydrated, aud soluble in that alkali.

Oxide of Zinc used to be prepared by the action of heat and air on the metal in a crucible, when it becomes oxidised by abstracting Oxygen from the atmosphere. So prepared, it is usually gritty, from containing small particles of metal, some of which may be got rid of by the process of elutriation. The L. P. prepared it by precipitating the Sulphate with Carb. Ammonia, and heating the Carbonate to drive off the $C\,O_2$. The process of the B. P. is similar.

Prep.—B. The *Carbonate of Zinc* is exposed to a dull red heat in a loosely-covered Hessian crucible until a portion taken from the centre no longer effervesces with dilute Sulphuric acid.

The Oxide of commerce often contains the Carbonate, or consists entirely of it.

Tests.—Yellowish-white; tasteless; entirely soluble in dil. Nit′ without effervescence; this solution is not affected by Chlor. Barium, but gives with Ammonia or its Carbonate a white precipitate entirely soluble in an excess of the test. Carb. Zinc is often sold in the shops for the Oxide of Zinc; and Mr Redwood (P. J. ii. 506) states that another kind of Oxide is a mixture of basic Sulph. Zinc and of Hydrated Oxide, and that the Oxides of Zinc of commerce are either basic Carbonates or basic Sulphates, containing only from 64 to 67 per cent. of Oxide. In obtaining this basic Sulphate, Ammonia is used as the precipitant. Any Sulphate of Zinc will be detected by the Barytic salt, added to the Nit. acid solution; any Chloride, by Nitrate of Silver; Iron, by the yellow colour of the Oxide; Copper, by the blue colour produced when the precipitate with Carb. Ammonia is dissolved by an excess of the precipitant; and if Carbonates of Lime or Lead are used for adulterating, they will effervesce with acids, and also remain undissolved (as well as the Iron) in Ammonia.

Inc.—Acids and acidulous salts, also caustic alkalies.

Action. Uses.—*Ext.* Desiccative. *Int.* Tonic and Antispasmodic.

Dose.—Gr. j.–gr. v. or more, twice a-day, in pill.

UNGUENTUM ZINCI, B.

Prep.—B. *Oxide of Zinc*, gr. lxxx.; *Benzoated Lard*, ℥j.

A mild siccative Ointment. The Benzoic acid in the Lard prevents it from becoming rancid (Redwood). The Ointment of the L. P. was made with Lard only. The ointment of B. 1864, with simple Ointment.

ZINCI CHLORIDUM, B. Chloride of Zinc. *Butter of Zinc.*

Chloride of Zinc has been highly recommended as a caustic by foreign surgeons, and by the late Mr Liston. It is a Protochloride (Zn Cl). Soluble in water and alcohol; very deliquescent in the air; it melts at 212°, and is volatilised by a red heat. As prepared below, it is in solid snow-white fragments or sticks, inodorous, and with a strong metallic taste.

Prep.—B. Put *Granulated Zinc*, ℥xvj., into a procelain basin, add by degrees *Hydrochloric acid*, ℥xliv., previously mixed with *Dist. water*, Oj., and aid the action by gently warming it on a sand bath until gas is no longer evolved. Boil for half-an-hour, supplying the water lost by evaporation, and allow it to stand on a cool part of a sand bath for twenty-four hours, stirring frequently. Filter the product into a gallon bottle, and pour in *solution of Chlorine*, q. s., by degrees, with frequent agitation, until the fluid acquires a permanent odour of Chlorine. Add *Carbonate of Zinc*, ℥ß, or q. s. in small quantities at a time, and with renewed agitation, until a brown sediment appears. Filter through paper into a porcelain dish, and evaporate until a portion of the liquid, withdrawn on the end of a glass rod and cooled, forms an opaque white solid. Pour it out now into proper moulds, and when the salt has solidified, but before it has cooled, place it in closely-stoppered bottles.

The H Cl is decomposed, the Cl combining with the Zinc, and H. Gas being evolved. Iron is apt to be present as an impurity in the Zinc, and a Chloride of Iron would thus be formed at the same time. By the addition of Chlorine the Iron is peroxidised and converted into Perchloride. Carbonate of Zinc being now added, the Iron salt is decomposed, and Peroxide of Iron separates, some more Zn Cl being formed, and CO_2 escaping. The iron being separated by filtration, the Zinc salt is concentrated till ready to solidify on cooling, when it is cast into moulds for use as a caustic, and kept from the air on account of its strong attraction for the water of the atmosphere.

Tests.—Colourless, deliquescent, soluble in water and in rectified Spirit. Prepared in rods or tablets. Hydrosulphuric acid and Ferrocyanide of Potassium cause white precipitates in the watery solution. What is precipitated by Ammonia or Potash, is white, and soluble in excess; and that by Carb. Potash, also white, but undissolved by an excess. Its solution is unaffected by Chlor. Barium and Oxalate Ammonia, and not tinged blue by the tests for Iron.

Action. Uses.—A powerful spreading caustic; used to destroy Nævi, Lupus, and cancerous sores. At the same time it destroys any bad odour. As with Caustic Potash, the neighbouring parts should be protected by lint or plaster. It may first be made into a paste with lard; or it may be mixed with flour or Sulphate of Lime, and then cast into sticks. (As a remedy for Cancer it was tried for some time at one of the London Hospitals in 1857, with a result which is believed to have been unsatisfactory.) It is sometimes given internally in epilepsy.

Dose.—Gr. ß–gr. ij.

LIQUOR ZINCI CHLORIDI, B. Solution of Chloride of Zinc.

Prep.—B. Mix *Hydrochloric acid*, ℥xliv., and *Dist. water*, Oj., in a procelain dish, add *Granulated Zinc*, ℔j., and apply a gentle heat to promote the action until gas is no longer evolved. Boil for half-an-hour, supplying the water lost by evaporation, and allow the product to cool. Filter it into a bottle and add *solution of Chlorine* by degrees, with frequent agitation, until the fluid acquires a permanent odour of Chlorine. Add *Carbonate of Zinc*, ℥ß, or q. s., in small quantities at a time, and with renewed agitation, until a brown sediment appears. Filter the liquid into a procelain basin, and evaporate until it is reduced to the bulk of two pints. (Similar to D. P.)

The solution of the D. P. had Sp. Gr. of 1·593. Sir William Burnett's *Disinfecting Solution* is also a solution of Chloride of Zinc, having a Sp. Gr. of 2·0. It was first introduced to preserve wood and clothes, but is now used for deodorising purposes. The Zinc combines with the Sulphur of Sulphuretted Hydrogen, and the Chlorine unites with the Hydrogen, so that by this action the noxious gas is neutralised (Sulphuret of Zinc and Hydrochloric being produced). Dr Pereira thinks this solution has little effect on Sulphuretted Hydrogen, except when the latter is in solution and combined with Ammonia. The solution coagulates Albumen and Gelatine, and thus becomes of use in preserving anatomical preparations, &c.

Zinci Carbonas (impura). Calamina. Calamine. Native impure Carbonate of Zinc. *F.* Calamine. *G.* Kohlensaures Zinkoxyd.

Calamine, or Carbonate of Zinc ($Zn\,O, C\,O_2$), is found in various parts of the world. But the same name is applied to two very distinct ores, one being a Silicate of Zinc, and the other a Carbonate. It is found in compact or earthy masses, readily scratched with a knife, and breaking with an earthy fracture. It is also found crystallised. Sp. Gr. 3·4 to 4·4. The colour is various; but, as usually seen, it is grey, pinkish, or reddish-yellow. It dissolves in Nitric and other acids with effervescence, and is not rendered electric by heat, by which characters it is easily distinguished from the Silicate, which is also called Electric Calamine. The Carbonic acid and Zinc will be indicated by their respective tests. The crystallised variety is anhydrous.

An impure Carbonate of Zinc is formed by burning, powdering, and washing the ore. It was used by the L. P. to form *Ceratum Calaminæ.*

By the process of roasting Calamine, some of the Carb′ and water are expelled, and a portion of Oxide of Zinc is formed. The mass being subjected to elutriation, it is often, like Chalk, prepared in little conical masses. It usually contains many impurities, as Oxide of Iron and other metals, and is adulterated with Sulph. Baryta, Carb. Lime, &c. Much of the Calamine of commerce has been shown by Dr R. D. Thomson and Mr Murdoch to contain no Zinc, but to be Sulph. Baryta coloured with Armenian Bole. More recently it has been stated (P. J. 1856) that *nearly all* the Calamine of commerce consists of native Sulphate of Baryta.

Zinci Carbonas, B. Carbonate of Zinc.

A precipitated Carbonate of Zinc is now substituted for the Prepared Calamine of the L. P., but for medicinal use, in ointments, &c., it possesses few advantages over the cheaper preparation.

Prep.—B. It is obtained by mixing boiling solutions of *Sulphate of Zinc* and *Carbonate of Soda* (10 parts to 10½), washing the precipitate till the water is no longer precipitated by Chlor. Barium, and drying with a gentle heat.

Sulphate of Soda being formed by the double decomposition, is removed by the washing. The heat is used, because in the cold the precipitate formed is apt to contain a basic Sulphate of Zinc, and some Soda. But the heat ordered, and the boiling employed by the B. P. do not produce a pure Carbonate. A great part of it is converted into the Oxide, the $C\,O_2$ escaping with effervescence. The B. P. gives the formula ($Zn\,O, C\,O_2\,H\,O + 2\,Zn\,O, H\,O$) for the result of the process, which it states to consist of one equiv. of the Carbonate and two of the Oxide of Zinc. The Carbonate thus made is a white, tasteless, inodorous, insoluble powder. It dissolves with effervescence, and without residue in dil. Sulph. acid, giving a solution which exhibits the reactions of a soluble Zinc salt.

Tests.—It is apt to contain some Sulphate and Chloride of Zinc, and some Copper, unless carefully made from the pure Sulphate as above. The solution in dil. $N O_5$ is not affected by $Ba Cl$, nor by $Ag O, N O_5$, and gives with Carb. Ammonia a white precip. soluble without colour in excess of the reagent.

Action. Uses.—Similar to those of the oxide. It forms an excellent soothing ointment with lard, or may be dusted over excoriated parts to allay irritation.

ZINCI SULPHAS, B.

Sulphate of Zinc. *Sal Vitrioli. White Vitriol. F.* Sulfate de Zinc. *G.* Schwefelsaures Zinkoxyd.

This salt is found native in some places. It is known in India by the name of *suffed tootia*, or white vitriol.

Prop.—Sulphate of Zinc ($Zn O, S O_3 + 7$ Aq.) is a colourless salt, without odour, but having a disagreeable astringent and metallic taste. The crystals are transparent, large or small, right quadrangular prisms terminated by four-sided pyramids (sometimes six-sided, from two opposite edges being truncated), often resembling those of Nitre, or, when small and acicular, like those of Epsom Salts. Like the crystallised Sulphates of Iron and Magnesia, they contain 7 Eq. of water. Exposed to dry air, they effloresce; they are soluble in 2½ parts of cold, and in less than their own weight of boiling water; insoluble in Alcohol. Heated, they melt in their water of crystallisation, which becomes dissipated, except one Eq. which requires from 266° to 284° of temp. to expel it. At a still higher degree, the acid is expelled, and only Oxide of Zinc left. This Oxide is also precipitated when the caustic alkalies are added to a solution of Sulphate of Zinc, and is redissolved in an excess of the Alkali. The Carbonated alkalies throw down Carbonate of Zinc, Ferrocyanide of Potassium, a white gelatinous-looking precipitate, and Sulphuretted Hydrogen a white Sulphuret of Zinc. Chloride of Barium and Acetate of Lead will throw down white precipitates of Sulphates of Baryta and of Lead. There are several varieties of this Sulphate of Zinc, forming Subsulphates; but the officinal salt is composed of $Zn O\ 28 + S'\ 28 + \text{Aq.}\ 44 = 100$.

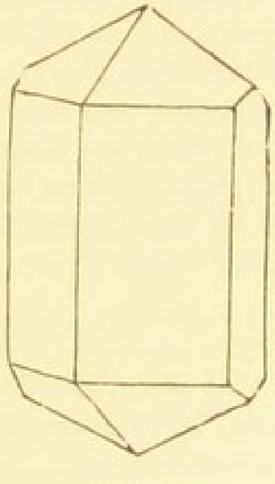

Fig. 26.

Sulph. Zinc may be prepared either by roasting the Sulphuret of Zinc (*i.e.*, Blende), or allowing it to oxidate spontaneously. In either case the Sulphuret acquires 4 Eq. of Oxygen (from $Zn S$ becoming $Zn O, S O_3$). The product is lixiviated and crystallised. This commercial Sulphate may be purified by crystallisation.

Prep.—B. The commercial product is pure enough for most purposes. The B. P. prepares a pure sulphate by dissolving *Granulated Zinc* in *Sulphuric acid*. The Iron present as an impurity is removed, as explained in the account of the process for preparing Chloride of Zinc, by adding *Chlorine water*, and afterwards *Carbonate of Zinc*. The solution is evaporated to form crystals, any Chloride of Zinc present remaining in the mother liquor.

Common White Vitriol of commerce may be readily purified by immersing a strip of metallic zinc in the solution. After some time the other metals Copper, Iron, &c., are precipitated upon it.

Tests.—Sulphate of Zinc, in its crude state, contains several metallic impurities, such as Copper, Lead, and Iron,—the last almost always, even when purified by crystallisation. That obtained by the above process contains no Iron. It is totally dissolved by water; what is thrown down by Ammonia is white, and when the Ammonia is added in excess, it is again dissolved. If a solution be boiled with a little Nitric acid, and treated with Ammonia, no yellow precipitate (*Peroxide of Iron*) remains, or a trace only, and the solution is colourless. Magnesia as well as Iron will be detected by its insolubility, Copper by a blue coloured solution with $N\,H_3$. Tincture of Galls should cause no purple colour. Arsenic of Cadmium may be detected by adding excess of Sul′ to the solution of the Sulphate, and then passing a stream of Hydrosulphuric′ through it: the Arsenicum and Cadmium are thrown down in the form of Sulphurets. (*p.*) Zinc is not precipitated by $H\,S$ from an acid solution.

Inc.—Alkalies, and their Carbonates, Lime water, Salts of Barium and of Lead, Astringent Vegetables.

Action. Uses.—*Ext.* Astringent. *Int.* Astringent; Anticonvulsive; in large doses, Emetic. (See above.)

Dose.—Gr. j.–gr. ij. 2 or 3 times a-day. When given in Epilepsy, the dose may be gradually increased to 5 gr. or more, without causing vomiting. Gr. x.–gr. xx. in solution as an Emetic.

ZINCI ACETAS, B. Acetate of Zinc.

Acetate of Zinc $(Zn\,O,\ C_4\,H_3\,O_3 + 2\ H\,O)$ is used internally as a tonic and antispasmodic, and topically in solution as an astringent lotion. It occurs in oblique rhomboidal prisms, or in thin crystalline plates, of a pearly lustre; very soluble in water and spirit; slightly efflorescent in the air; having a bitter metallic taste. By heat they are first fused, then decomposed. Sulph. acid disengages Acetic, which may be recognised by its odour. Zinc may be recognised in the solution by its appropriate tests.

Prep.—The solution may be readily made by a double decomposition. 190 grains of cryst. Acetate Lead mixed in solution with 143 grains of cryst. Sulphate Zinc, produce 91 grains of (anhydrous) Acetate Zinc, and 152 of insoluble Sulphate Lead, which may be separated by a filter.

The B. P. prepares it by dissolving the *Carbonate of Zinc* (℥ij.) in *Acetic acid* (℥v. or q. s.), and evaporating to form crystals.

It may also be made by immersing sheet Zinc in a solution of Acetate of Lead. The Acid and the Oxygen quit the lead for the Zinc. Metallic lead is precipitated, and a solution of Acet. Zinc is formed.

Tests.—In the solution, any Lead may be detected by $H\,S$; any Iron by Ferrocyanide Potassium, giving a blue precipitate; any Sulphuric acid by a precip. with Chlor. Barium, insol. in Nitric′, and any Copper by the Ammonia test.

Uses.—Internally as an antispasmodic, gr. j.–gr. v. In astringent lotions or injections for Ophthalmia, Gonorrhœa, and Ulcerations, gr. x.–gr. xx. in ℥j. water.

Citrate of Iron and Zinc has been used. It is a tonic and astringent, similar in composition to the Ammonia-Citrate of Iron, q. v.

ZINCI VALERIANAS, B. Valerianate of Zinc.

Formula ($ZnO, C_{10}H_9O_3$). It is produced by a double decomposition between Valerianate Soda and Sulph. Zinc. It occurs in white pearly tabular crystals, nearly insoluble in cold, but soluble in hot water; sol. in Alcohol, nearly insol. in Ether. Strong acids or a boiling temperature decompose the solution, setting free Valerianic′, which may be recognised by its odour. A similar odour is observed in the salt itself. When heated to redness Oxide of Zinc is left.

Prep.—B. Dissolve *Sulphate of Zinc*, ℥v¾., and *Valerianate of Soda*, ℥v., each in two pints of *Dist. water;* raise both solutions to near the boiling point, mix them, cool, and skim off the crystals which are produced. Evaporate the mother liquor at a heat not exceeding 200°, till it is reduced to ℥iv.; cool again, remove the crystals which have formed, and add them to those which have been already obtained. Drain the crystals on a paper filter, and wash them with a small quantity of cold Distilled water, till the washings give but a very feeble precipitate with Chloride of Barium. Let them now be again drained, and dried on filtering paper at ordinary temperatures.

The soluble Sulphate of Soda is left in the mother liquor, and removed by washing. That no cryst. of this may be obtained, the liquid is not to be evaporated beyond f℥iv.

The heat is kept low to prevent the decomposition of the Valerianic acid. The D. P., from which the formula is taken, prescribed that the crystals should be dried at a heat not exceeding 100°. The B. P. allows only the ordinary temperature of the atmosphere.

Tests.—The Sulphate or Acetate of Zinc, to which Oil of Valerian has been added, are frequently substituted. They may be detected by their solubility, by the solution having on its surface a film of oil, and the Sulphate by Ba Cl. When such a spurious specimen is heated with an acid, little or no Valerianic′ can be separated by distillation. Another adulteration, with *Butyrate of Zinc*, which much resembles the Valerianate, is less easily discovered. The insolubility of the Butyrate of Copper, the Valerianate being comparatively soluble, furnishes a test. "It gives when heated with dilute Sulphuric acid a distillate, which, when mixed with the solution of Acetate of Copper, does not immediately affect the transparency of the fluid, but forms after a little time oily drops, which gradually pass into a bluish-white crystalline deposit." (B.) The distillate is Valerianic′ acid, with also any Butyric acid that may be present. With the solution of the acetate (1 in 10) the Butyric acid gives at once a green precip., the Valerianic′ behaves as stated. Zinc may be recognised by its tests.

Action. Uses.—A tonic and antispasmodic in Hysteria and Epilepsy.

Dose.—Gr. j.–gr. iij. in pills. It is recommended by some as combining the actions of Zinc and Valerian.

CUPRUM, B.

Copper. (Fine Copper wire, about No. 25, B.) Venus of the Ancients. *F.* Cuivre. *G.* Kupfer.

Copper was, with Gold and Silver, one of the most anciently known of the metals. It is abundantly diffused in nature, being found native as an Oxide, a Sulphuret, and as a Sulphate, Carbonate, Arseniate, and Phosphate.

Copper ($Cu = 31{\cdot}75$) is a reddish-coloured metal, of a disagreeable smell when rubbed, and of an unpleasant taste. Sp. Gr. 8·85 to 8·95; very ductile and malleable, and possessed of considerable tenacity. It melts at 1996° (Daniell). Its crystals, obtained on the cooling of the fused metal, are rhomboidal, but those of native Copper are cubes or octohedrons. It oxidises slowly in the atmosphere, becoming covered with a green crust of Subcarbonate of Copper. It decomposes water only at a bright red heat. Its oxygenation is much promoted by many acids, as the Nitric, and caused even by the weaker acids when exposed to the air, also by alkaline and fatty substances. There are two Oxides of Copper. One, a *Suboxide* or *Dinoxide* ($2\,Cu, O$), also called Red Oxide of Copper, is found native in octohedral crystals; when hydrated, it is of a lively yellow colour. The *Protoxide* ($Cu\,O$) or Black Oxide of Copper, is, as its name indicates, of a black colour, but blue when hydrated. It combines readily with acids, and thus forms the base of the ordinary salts of Copper, which are of blue or green colour when hydrated, but white when anhydrous.

Copper is easily recognised by its colour, taste, and smell, when rubbed. It may be dissolved in Nitric acid, when it may be known by reagents, as in solution of Sulphate of Copper.

Metallic Copper is not possessed of any action on the system, if pure; but when oxidised, or combined with acids, is a powerful poison. The Copper wire mentioned in the B. P. is selected as the purest form of Copper known in commerce.

Use.—Pure Copper foil is used in the B. P. as a test. It is employed as an important test for Arsenic. (q. v.) If a bright strip of it be introduced into a solution of Nitrate of Silver, the acid combines with the Copper, and the Silver is precipitated on its surface as a white powder. Mercury is also precipitated thus from its solutions, but may be distinguished by the white crust running into globules when rubbed with the finger, and leaving behind a bright amalgamated surface.

Antidotes in Copper poisoning.—Evacuate the stomach; administer white of eggs, and milk, tepid diluents, antiphlogistics.

Action and Uses of the Copper Compounds.—The salts of Copper much resemble those of Zinc in their medicinal action. Externally, they are caustic when in the solid state or in strong solution, astringent when the latter is diluted. Given internally, they are astringent and antispasmodic, or in large dose emetic. Thus the Sulphate may be used externally as an astringent in Gonorrhœa, or applied in the solid form to check fungous granulations; internally, in small doses, as an astringent in Diarrhœa, an antispasmodic in Epilepsy, or as an emetic in the same way as the Sulphate of Zinc. The Ammonio-Sulphate may also be employed in Epilepsy. The insoluble Diacetate, Verdigris, is made use of to form a detergent liniment for application to external ulcers and inflamed parts.

CUPRI SULPHAS, B.

Sulphate of Copper. *Cuprum Vitriolatum. Vitriolum Cœruleum.* Blue Vitriol. *Blue Stone. F.* Sulfate de Cuivre. *G.* Kupfer-Vitriol.

This salt is produced naturally in the water of many mines. It was no doubt employed by the ancients, as it was by the Arabs and Hindoos: by the latter it is called *neela tootia*, or blue vitriol.

Prop.—Sulphate of Copper ($CuO, SO_3 + 5$ Aq.) is of a fine blue colour, without odour, but having a powerful styptic disagreeable taste. Usually seen in fragments of large rhomboidal (or oblique prismatic) crystals. Sp. Gr. 2·2. Exposed to the air, these effloresce, from losing a portion of their water of crystallisation. They may be dissolved in four times their weight of cold and in twice their weight of boiling water. When heated, the crystals first melt in, then lose, their water of crystallisation, and fall into a greenish-white crumbly powder; at a still higher heat, the acid is decomposed, sulphurous fumes escape, and the Oxide is left, of a brown colour. The solution is of a light or deep blue colour, according to its strength. The alkalies throw down precipitates of a more or less bluish-green colour; if a small quantity be added, a Subsulphate is precipitated; but if a larger quantity, a hydrated Oxide. An azure-blue precipitate is produced by Ammonia, which is redissolved by an excess of the precipitant. Sulphuretted Hydrogen throws down a brownish-black precipitate of Sulphuret of Copper; Ferrocyanide of Potassium a reddish-brown one of Ferrocyanide of Copper. Arsenious acid, if a little alkali (as Ammonia) be added at the same time, throws down a grass-green precipitate of Arsenite of Copper. A polished Iron or Zinc plate, introduced into the solution, becomes covered with a metallic coating of Copper. By these tests the presence of Copper is indicated; that of the Sul′ will be revealed by its tests.

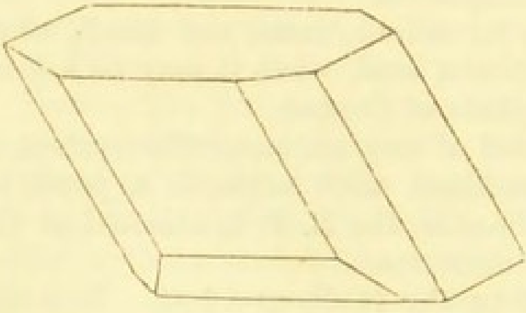

Fig. 27.

Prep.—Sulphate of Copper may be prepared by boiling Copper in diluted Sul′. This acid being decomposed, Sulphurous acid escapes. 1 Eq. Ox. combines with the metal, which dissolves in the remaining Sul′. More commonly it is made by exposing the Sulphuret to air and heat, when both the Sulphur and metal, becoming oxidated, combine to form the Sulphate. As the native Sulphuret contains both Iron and Copper, so does the salt produced contain Sulphates of Iron and of Copper. A great portion of the Sulph. Iron is got rid of by fresh exposure to heat and air, when it is decomposed and the Iron peroxidised, and the Sulphate of Copper separated by solution and crystallisation. This is the commercial Sulphate. The B. P. (1864) purifies it by dissolving in boiling *Dist. water*, filtering, evaporating, and crystallising.

Tests.—Totally soluble in water. In the air it becomes slightly pulverulent. Whatever Ammonia throws down from its solution, an excess of Ammonia dissolves. If any Iron be present, it will become green in the air, and not be dissolved by the Ammonia. If the Iron is peroxidised by adding solution of Chlorine, it is at once precipitated by Ammonia in excess.

Inc.—Alkalies and their Carbonates, and many salts, as Borax, Chloride of Calcium, Tartrate of Potash, salts of Lead, Nitrate of Silver, Astringent Vegetable Infusions.

Action. Uses.—Irritant, Escharotic, Astringent, Anticonvulsive. In large doses, Emetic.

Dose.—Gr.ß–gr. ij. Astringent. Gr. iv.–gr. xij. Emetic.

[Cupri Ammonio-Sulphas, L. Cuprum Ammoniatum. Ammoniæ Cupro-Sulphas. Ammonio-Sulphate of Copper. *F.* Cuivre Ammoniacal. *G.* Kupfer Salmiak.

This preparation forms a beautiful azure-coloured powder, which has a strong odour of Ammonia, and a disagreeable coppery taste. It is prepared by rubbing together Sulph. Copper and Sesquicarb. Ammonia; and as a portion of the latter remains in excess, the Ammoniacal odour and an alkaline reaction on test-paper are observed. From the volatile nature of the Ammonia, it escapes when the preparation is exposed to the air or is too much dried, and is therefore apt to vary in its properties. When well made it ought to dissolve in water; but if there be a deficiency of Sesquicarb. Ammonia, it is not only insoluble, but is further decomposed with precipitation of a Subsulphate of Copper. Many of the characteristics of the Sulphate of Copper are displayed by this preparation; and the solution of Arsenious acid renders it of a green colour, from combining with the Oxide of Copper, and forming the green insoluble Arsenite of Copper. This salt is not officinal in the B. P., but its solution is used as a test.

Prep.—L. Rub together *Sulph. Copper*, ℥j., and *Sesquicarb. Ammonia*, ℥jß, till Carb′ is no longer evolved. Wrap the mass in bibulous paper, and dry it in the air.

On rubbing together the Sulph. Copper and Sesquicarb. Ammonia, effervescence ensues, from the escape of a great portion of the Carb′, and the mixture becomes of a deep blue colour, and moist from the water of crystallisation of the salts. There is some difference of opinion about the chemical nature of this substance, but it is most probable that it consists of a double salt called Cupro-sulphate of Ammonia $(N\,H_3,\ Cu\,O + N\,H_3,\ S\,O_3,\ H\,O)$ with some excess of Sesquicarb. Ammonia, and occasionally a little Subsulphate of Copper. In the above salt (which may be obtained in crystals by mixing solutions of the Sulphate and Sesquicarbonate in the atomic proportions, and evaporating) the Oxide of Copper acts the part of an acid. It seems that in the formation of this substance, 1 equivalent of each of the mixed salts is required. 1 Eq. of Sesquicarb. Ammonia contains 2 of Ammonia and 3 of Carb′. All the $C\,O_2$ escapes. The Sulph. Copper being decomposed, $Cu\,O$ unites with 1 Eq. of Ammonia, and the $S\,O_3$ with the other Eq., forming a Cuprate and a Sulphate. These together constitute the Cuprosulphate—

$$Cu\,O,\ S\,O_3,\ 5\ Aq. + 2\ N\,H_3,\ 3\ C\,O_2,\ 2\ Aq. = (Cu\,O,\ N\,H_3, + N\,H_3,\ S\,O_3,\ H\,O) + 3\ C\,O_2 + 6\ Aq.$$

Tests.—By heat it is converted into Oxide of Copper, evolving Ammonia. Dissolved in water, it changes the colour of Turmeric, and solution of Arsenious acid renders it of a green colour. L. P.

Inc.—Acids, Potash and Soda, Lime water.

Action. Uses.—Irritant, Astringent, Antispasmodic, Emetic. In Epilepsy, and as lotion to ulcerated cornea, or injection in Gonorrhœa.

Dose.—Gr. ¼.–gr. v. gradually increased.]

The B. P. makes use of a test Solution of Ammonio-Sulphate of Copper made with ½ oz. Sulph. Copper, Ammonia q. s., and water 10 oz.

ÆRUGO. (CUPRI DIACETAS IMPURA.) (B., Appendix.) Cupri Subacetas. Verdigris. Commercial Sub-acetate of Copper. *F.* Vert de gris. Acetate basique de Cuivre. *G.* Grünspan.

Ærugo or Verdigris must have been early known, from the employment of Copper vessels, as well as of Vinegar and sour Wines. It was, in fact, employed by the Greeks as a medicine, also by the Arabs, and probably by the Egyptians. There is little doubt, however, that the term Ærugo, as well as the χαλκοῦ ἰός, included the Carbonate as well as this Acetate of Copper.

Prop.—Verdigris is sold either in powder or in amorphous masses of a pale bluish-green or of a bright blue colour, with an odour of Vinegar, and a disagreeable coppery taste. It remains unchanged in the air; but when heated, water is first expelled, and then Acetic′, Oxide of Copper being left, with some metallic Copper. Verdigris is insoluble in Alcohol; and decomposed by water, being resolved into an Acetate which dissolves, and a dark green insoluble powder, which afterwards becomes black, and is a Subacetate or a Tribasic Acetate of copper. Sul′ decomposes it with effervescence. There are several compounds of Acetic′ and Copper, but the bluish-coloured Verdigris (Acetate de Cuivre bi-basique) is the one that has been most employed in medicine. The composition of this has been shown by Mr R. Phillips to be 2 Eq. of Copper combined with 1 of Acet. acid and 6 of water; that is, a Hydrated Diacetate ($2\ Cu\,O + \overline{Ac} + 6\ Aq.$) But Verdigris, when of a green colour, contains the

Subsesquiacetate and the Trisacetate. 2 Eq. of the officinal Diacetate are equivalent to 1 Eq. of neutral Acetate (soluble in water), and 1 of Trisacetate (insoluble), and are resolved into these by the agency of water.

$$2\,(2\,Cu\,O,\ \overline{Ac}) = Cu\,O,\ \overline{Ac} + 3\,Cu\,O,\ Ac.$$

Prep.—Verdigris may be made by acting on plates of Copper with Vinegar or with Ac′. Under the influence of air the Copper becomes oxidised, combines with the acid, and the Verdigris is scraped off as formed. In the south of France sheets of Copper are stratified with the refuse of the grape left after making wine, and allowed to remain for a month or six weeks. Acetous fermentation takes place, and the Copper becomes coated with Verdigris, which is scraped off, and the operation repeated. The different scrapings form a paste, which is well beaten with wooden mallets, then packed in leathern bags.

Tests.—Almost entirely soluble in Dil. Sul′ with the aid of heat; partially soluble in water. From this solution nothing is precipitated by Ammonia added in excess (Cu O being soluble in it). It is dissolved in a great measure by H Cl, not above five per cent. of impurity being left. The Sul′ forms a blue and the H Cl a green solution. Acetic acid dissolves it, forming the Acetate.

Inc.—Strong Acids, Alkalies, and their Carbonates.

Action. Uses.—Detergent, Escharotic, Emetic. Applied to warts and venereal ulcers.

Dose.—Usually applied externally only. Dose internally, gr. ß.

A test solution of the *Acetate of Copper* is made by the B. P. with ½ oz. of Verdigris, 1 oz. of Acetic Acid, and water to 5 oz.

[LINIMENTUM ÆRUGINIS, L. *Mel Ægyptiacum. Unguentum Ægyptiacum.*

Prep.—Dissolve powdered *Verdigris* ℥j. in *Vinegar* f℥vij. Strain through linen. Add *Clarified Honey* ℥xiv. Boil to a proper consistence.

Action. Uses.—Stimulant and slightly Escharotic. Applied with a camel's hair brush to ulcers; or, diluted, employed as a gargle.]

PLUMBUM.

Lead. Saturn of the Alchemists. *F.* Plomb. *G.* Blei.

Lead (Pb=103·5) is one of the most anciently known of the metals. It is found chiefly as Sulphuret or Galena, but occurs in a metallic state as an oxide, and combined with several acids.

Prop.—Lead is of a bluish-grey colour; fresh cut, is of great brilliancy, but soon tarnishes; has a slight taste, and a peculiar smell when rubbed; is soft, marks paper; has a little tenacity, but may be beaten into thin sheets. Sp. Gr. 11·435. It melts at 612°, and boils at a red heat; on solidifying, it contracts, and may be crystallised in octohedrons. Exposed to the air, the surface becomes covered with a greyish pellicle. It may be preserved unchanged under perfectly pure water; but if any air be present, the Lead becomes oxidated, and some of it combining with the Carb′, white Carb. Lead with Hydrated Oxide is formed. This change also readily takes place when rain or any other equally pure water is exposed to the action of air in leaden cisterns or pipes. The vessels become coated with a white incrustation of a pearly lustre, and some of the fine crystals may be seen floating on the water, in which a part being (dissolved or) suspended, it becomes poisonous. Dr Christison ascertained that the opinion of G. Morveau was correct, that the presence of any neutral salts, especially of Sulph. and Carb. of Lime, which are usually present in spring or river water, or a minute trace of Sul′ or Phosp′, prevents the continued corrosion of the Lead. The Oxide and Carb. being allowed to be deposited and to adhere with firmness to the Lead, and the other insoluble salts, such as Sulph. Phosph., and Carb. Lead, becoming added, protect the Lead with an impenetrable coating, instead of its being carried away by the water. The late Professor Daniell ascertained that when water contains free Carb′, Lead is readily dissolved; such water cannot therefore be safely kept in or transmitted through that metal.[*] So that in perfectly pure water lead is not affected; in rain or river water, which is comparatively pure, but contains Carb′, it is acted upon, and the Carbonate formed held in solution by more CO_2; and in common water containing saline matters, it is acted upon, but protected by the precipitation of insoluble matters. Though at ordinary temperatures Lead is little liable to oxidate, in a state of very fine subdivision it will take fire when exposed to the air. It is also readily oxidated and dissolved by Nit′. (*See* Acet. and Nitr. Lead for the effect of reagents.) It unites with Oxygen in several proportions, also with Sulphur, Phosphorus, Iodine, and Chlorine; likewise with numerous metals, and, in the state of Protoxide, forms with the acids and fatty substances various compounds. Zinc separates it from any of its solutions. Lead is obtained very pure, for chemical purposes, from the Nitrate; but, on the large scale, almost entirely from the Sulphuret, or Galena, by the process of roasting, when Sulphate and Oxide of Lead are formed. To these Lime and Carbonaceous matter are added, the former for the purpose of decomposing the Sulph. Lead, and the other to unite with the Oxygen of the Oxide of Lead, and thus both the Oxide and Sulphate are reduced to a metallic state.

Tests.—Lead is usually sufficiently pure for Pharmaceutical purposes, but often contains Iron or Copper. These may be detected by dissolving it in dilute N′, and precipitating with a little excess of Sul′. On the addition of Ammonia to the filtered solution, it will become of a violet if Copper, and of a yellow colour if Iron be present. If a plate of Zinc be introduced into a solution of Lead, this metal will be deposited in an arborescent form. Alkalies, combining with the acid of its salts, throw down the Hydrated Oxide; Sul′

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[*] Water which contains less than an 8000th of salts (such as Carbs. and Sulphs.) in solution (a 4000th or even a larger proportion of Chlorides is insufficient) cannot be safely conducted in Leaden pipes without certain precautions. A remedy may be found either in leaving the pipes full of water and at rest for 3 or 4 months, or by substituting for the water a weak sol. of Phosph. Soda in the proportion of about a 25,000th part. Christison, Edin. Phil. Trans. xv. part ii.; Pharm. Journ. ii. 335; R. Phillips, jun., P. J. iv. 304.

and its salts, a white insol. Sulphate; Chromate of Potash, a yellow Chromate; Hydrosul′ and its salts, a black Sulphuret; Iodide of Potassium, a yellow Iodide, and the Ferrocyanide of Potassium, a white Ferrocyanide of Lead.

Action and Uses of the Lead Compounds.—They are all more or less poisonous. The Oxide of Lead, which is insoluble, is not used internally, but is employed in the preparation of Plasters, Cerates, and Ointments, for which purposes it is peculiarly adapted by its power of entering into chemical combination with the fatty acids.

The soluble preparations of Lead are used as astringents, both externally and internally. They are also possessed of considerable power in certain spasmodic complaints, whence they have been called sedative. The Acetate and Diacetate are both employed to form Collyria in Ophthalmia, injections in Gonorrhœa and Leucorrhœa, and cooling lotions for external use. The Acetate is the best suited for internal exhibition. It is given in Hæmoptysis, and in numerous fluxes, especially Diarrhœa. It must not be continued too long, or symptoms of chronic lead poisoning will come on. These begin with a blue line at the margin of the gums, a symptom which should be taken as a warning to leave off the use of the remedy. Acetate of Lead has been used with advantage in Epilepsy. The Iodide of Lead is employed externally as a resolvent application to Scrofulous Swellings.

OXIDES OF LEAD.

There are several Oxides of this metal. 1. The SUBOXIDE or Dinoxide, of a dark grey colour, supposed by Berzelius to form the pellicle which covers Lead that has been exposed. 2. PROTOXIDE, of a yellow colour, commonly called *Massicot* or Litharge. 3. RED OXIDE, sometimes called Peroxide, Red Lead, and Minium, Plumbi Oxidum Rubrum, supposed by some to be a compound of the 2d and 4th; and 4, a BROWN, BIN–, or Peroxide.

PLUMBI OXIDUM, B. Lithargyrum, B. (1864.)

Oxide of Lead, fused. Litharge. *F.* Protoxide de Plomb. *G.* Bleioxyd.

This Oxide of Lead ($PbO = 111{\cdot}5$) was known to the ancients, being easily produced when melted Lead continues to be exposed to a current of heated air. The surface of the metal becomes rapidly covered with a scaly powder of a sulphur-yellow colour, which is the Protoxide of Lead, and which, being skimmed off, is known in commerce by the name of *Massicot.* When the heat is continued to a bright red, some metallic Lead is separated, the Oxide is fused, though imperfectly, and, on cooling, becomes an aggregated mass, which readily separates into crystalline scales of a greyish-red colour. These form the *Litharge* of commerce, which varies in colour, and is called *Gold Litharge* when of a red colour, owing to the presence of a little *Red Lead,* but *Silver Litharge* when lighter coloured. These are frequently obtained in the process of refining Gold and Silver by means of Lead, and in separating the Silver from Argentiferous Lead.

Prop.—Litharge is nearly insoluble in water; tasteless; Sp. Gr. 9·42. It may be melted into a glass, but is readily reduced to a metallic state if Carbon be present. It is remarkable for its power of depriving many vegetable substances of colour. It is readily dissolved in diluted Nit′ or Acet′, as also in some other acids, and absorbs Carb′ from the atmosphere. Comp. Pb 92·85 + O 7·15 = 100.

Tests.—The Litharge of commerce is liable to contain a little Iron, also Copper, Carb. Lead, Silica, and other earths. Almost entirely soluble in dil. Nit′. This solution becomes black on adding H S. Potash throws down a white precipitate, which is redissolved by the same in excess. If Sulphate of Soda be added to 100 grains of this oxide, dissolved in dil. Nit. acid, 135 grains of Sulphate of Lead are precipitated. If the whole is soluble in Nit′, it proves that neither Sulph. Baryta nor Sulph. Lead is present; and the want of effervescence, that there is no Carb. Lead. Copper and Iron will be detected by their respective tests. "The solution in dil. Nit. acid, supersaturated with Ammonia, and then cleared by filtration, does not exhibit a blue colour" (Copper). B.

Action. Uses.—Litharge, like the other preparations of Lead, will affect those exposed to its influence; but it is only employed Pharmaceutically, as for making Diacetate of Lead, and by combining with oil to form the Lead Plaster, which is the basis of several other Plasters.

EMPLASTRUM PLUMBI, B. Emplastrum Lithargyri, B. (1864.) Litharge or Lead Plaster. Diachylon Plaster.

Prep.—B. Take of *Oxide of Lead*, in fine powder, ℔iv.; *Olive Oil*, Cj.; *Water*, Oiijß. Boil all the ingredients together gently by the heat of a steam bath, and keep simmering for four or five hours, stirring constantly until the product acquires a proper consistence for a plaster, adding more water during the process if necessary. (The quantity of Litharge is one-third less than was ordered by the L. C.)

The oil consists of two acids, Oleic and Margaric, each combined with a base, Glycerine. The Oxide of Lead displaces the latter, forming two soaps or fatty salts, Oleate and Margarate of Lead. These united make the plaster, insoluble in water. The Glycerine is soluble in water, and removed by its agency.

Action. Uses.—Forms excellent strapping from its mildness, and is useful in surgical cases in keeping together the lips of wounds.

Off. Prep.—Emp. Resinæ, Saponis, Calefaciens, Galbani, Ferri, Hydrargyri.

EMPLASTRUM RESINÆ, B. Emp. Resinosum. Emp. Adhæsivum. Resin Plaster, Adhesive or Sticking Plaster. Basilicon Plaster.

Prep.—B. Take *Lead Plaster*, ℔ij.; *Resin*, ℥iv.; *Hard Soap*, ℥ij. Melt the Plaster of Lead with a gentle heat, add the Resin and Soap, also melted, and mix. (It is less irritant than the plaster of the L. P., which contained more Resin, and no Soap.)

Action. Uses.—This plaster, serving the same purposes as Lead plaster, is more frequently employed on account of being more adhesive; but is objectionable in some cases, in consequence of being more irritant to the skin. It is used as strapping to give support to Ulcers, Buboes, &c.

Off. Prep.—Emp. Belladonnæ, Calefaciens, Opii, Plumbi Iodidi.

EMPLASTRUM SAPONIS, B. Soap Plaster.

Prep.—B. Take of *Hard Soap*, ℥vj.; *Lead Plaster*, ℔ij¼; *Resin*, ℥j. To the Lead Plaster, melted by a gentle heat, add the Soap and the Resin, first liquefied; then, constantly stirring, evaporate to a proper consistence.

Action. Uses.—It differs from the resin plaster in being less irritant and less adhesive, containing more soap and less resin. It is used to cover and protect sore places from the air.

Off. Prep.—Emp. Calefaciens, Plumbi Iodidi.

EMPLASTRUM CERATI SAPONIS (B. 1867) is the same as Ceratum Saponis Comp., L. P. It contains Acetate of Lead.

In the L. P. of 1836, *Plumbi Oxidum Hydratum* was ordered to be used in the preparation of Disulphate of Quinine; and *Plumbi Chloridum* in that of Hydrochlorate of Morphia. They are now both omitted, as no longer used for these purposes.

PLUMBI OXIDUM RUBRUM.

Red Oxide of Lead. Red Lead. Minium. *F.* Oxide rouge de Plomb. *G.* Mennig Rothes Bleioxyd.

Red Lead or Minium, as this Oxide is called, was known to the Arabs, and is the Suranj of Avicenna, commonly translated Cinnabar. It is prepared by the Hindoos, and is their *Sundoor.* Dioscorides (lib. v. c. 109) knew that Minium was distinct from Cinnabar. It is sometimes called Binoxide, also Deutoxide of Lead.

Prop.—Red Oxide of Lead ($Pb_3\,O_4$), or Minium, forms a powder in scales of a bright red colour; tasteless, heavy (Sp. Gr. about 9), and insoluble in water. When heated, it melts, then gives out Oxygen, and becomes converted into the Protoxide. If placed on Charcoal, it is reduced, with the flame of the blowpipe, to a globule of Lead. It is only partially soluble in diluted Nit′, being converted into two Oxides, a brown-coloured Peroxide, which is left, and a Protoxide which is dissolved. The composition of the Red Oxide has not been definitively settled; indeed the Red Lead of commerce is considered to be variable in composition. But 2 Eq. of Protoxide with 1 of the Binoxide, may be considered one of the most common proportions.

Prep.—Obtain by exposing Massicot or the Protoxide to air and heat below what is required for fusion, when the quantity of Oxygen required is absorbed, and the yellow Protoxide converted into bright red-coloured Minium.

Tests.—Red Lead is not very liable to adulteration, but brick-dust or red-bole (insoluble in Nitrous acid) is sometimes mixed with it; also Red Oxide of Iron, which may be detected by testing the solution in Nitric acid with Tincture of Galls.

Action. Uses.—Red Lead might be employed for the same purposes as the Protoxide. It was used by the E. C. for purifying concentrated Acetic acid, and for making Aqua Chlorinii.

PLUMBI IODIDUM, B.

Iodide of Lead. *F.* Iodure de Plomb. *G.* Iod-Blei.

(From the L. P., restored in B. P. 1867.)

Iodide of Lead (Pb I) may be formed by the direct action of Iodine on Lead, or as below. It is usually seen in the form of a fine yellow powder, which is without taste or smell, insoluble in cold but readily dissolved in boiling water, forming a colourless solution. But as this cools, it becomes deposited in brilliant scale-like crystals of a golden-yellow colour, in which form it is also sold, and is then very pure. It is first melted and then decomposed by heat, the Iodine being dissipated in violet-coloured vapours. It is soluble in Acet′ and Alcohol, also in solution of Potash.

Prep.—B. Dissolve *Nitrate Lead* ℥iv. in *Aq. dest.* Ojß, and *Iodide Potassium* ℥iv. in *Aq. dest.* Oß. Mix the solutions. Wash the precipitate. Dry it at a gentle heat.

By mutual decomposition, Iodide of Lead is formed and precipitated, while the Oxygen of the Oxide of Lead in the Nitrate being transferred to the Potassium, Potash is formed, which, uniting with the acid, forms a soluble Nitrate of Potash.

Tests.—Totally dissolved by boiling water, and as this cools, separating in shining yellow scales. It melts by heat, and the greater part is dissipated, first in yellow (Iodide of Lead), and afterwards in violet vapours. If 100 grs. of Iodide of Lead be dissolved in Nitric′ diluted with twice its weight of boiling water, and after the Iodine is expelled, Sulphate of Soda be added, 66 grs. of Sulphate of Lead are thrown down. L. P.

Action. Uses.—It has been used externally, and sometimes internally, as an alterative.

Dose.—Gr. ¼ to gr. ij.

UNGUENTUM PLUMBI IODIDI, B.

Prep.—B. Mix well together *Iodide of Lead* gr 62, and *Simple Ointment* ℥j.

EMPLASTRUM PLUMBI IODIDI, B.

Prep.—Take of *Iodide of Lead*, ℥j.; *Soap Plaster* and *Resin Plaster*, each ℥iv. Add the Iodide of Lead in fine powder to the plasters previously melted, and mix them intimately.

Discutient in chronic enlargements of the joints and in scrofulous tumours.

PLUMBI CARBONAS, B.

Carbonate of Lead. *Subcarbonate of Lead. Cerussa. White Lead.* *F.* Carbonate de Plomb. *G.* Kohlensaures Bleioxyd. Bleiweiss.

Carbonate of Lead ($Pb\,O,\ C\,O_2$) is one of the most anciently known of the metallic salts. It is found as a mineral in many Lead districts, and known as Cerusse and White Lead ore.

Prop.—Carb. Lead is white, tasteless, and heavy; either in powder or in white amorphous masses. When found in nature, its crystals vary much in form from the right rhombic prism from which they proceed. Sp. Gr. about 6·25. It is insoluble in water. Heated, the Carb′ escapes, and the yellow Protoxide of Lead is left; on Charcoal and before the blowpipe, it is reduced to a globule of metallic Lead. It is soluble with effervescence both in the Acetic and the Nitric acids. Acetate and Nitrate of Lead being the result, will be affected by reagents like other preparations of Lead.

Carbonate of Lead may be prepared by the action of air and pure water on metallic Lead, or by passing a current of Carb′ gas through a solution of Diacet. Lead. The most ancient method, and that which makes the best White Lead for the use of painters, is by exposing sheets of Lead to the fumes of Vinegar or of strong Acet′. The latter is placed in an earthen vessel, and the former a little above it, either rolled spirally or cast into bars. The pots are arranged side by side, and imbedded in a mixture of new and spent tan (ground oak bark). The tan gradually heats or ferments, and begins to exhale vapour, the temperature of the inner parts of the stack rising to 140° or 150°, or even higher. The Acet′ is slowly volatilised, and its vapour passing readily through the gratings or folds of Lead, gradually corrodes the surface of the metal, upon which a crust of Subacetate is formed, but is decomposed by the rising vapours, and converted into Carbonate of Lead, there being an abundant supply of Carb′ furnished by the slow fermentative decomposition of the tanners' bark. The White Lead, crushed and broken up, is transferred to mills, where it is ground up into a thin paste with water, washed and dried. As met with in commerce, it contains some hydrated oxide, and the B. P. gives for it the formula $2\,(Pb\,O,\,C\,O_2) + H\,O,\,Pb\,O$.

Tests.—Dissolved with effervescence in dil. Nit′ (or Acetic acid). What is precipitated from the solution by Potash is white, and is redissolved by excess of it: it becomes black on the addition of Hydrosul′. It becomes yellow by heat, and when heated with Charcoal, is reduced to metallic Lead. It does not lose weight at a temperature of 212°. The solution in $N\,O_5$ (or Acetic) gives a yellow precipitate of Iodide of Lead with $K\,I$, a white one of Sulph. Lead with $S\,O_3$. Sulph. Baryta is often mixed with it; it is insoluble in Nitric acid. Chalk is detected by dissolving in Acet′, and separating the Lead with $H\,S$, then testing with Oxalate of Ammonia.

Action. Uses.—Desiccative and Astringent. Applied only externally, as by dusting on excoriations. Dr A. T. Thomson considered it the only poisonous salt of Lead, the others becoming so by being first converted into Carbonate of Lead.

Unguentum Plumbi Carbonatis, B.

Prep.—B. Mix thoroughly *Simple Ointment* ℥j., and *Carb. Lead* in fine powder gr. 62.

Action. Uses.—A cooling and drying application to excoriations and burns, also to ulcers and eruptions attended with irritation.

PLUMBI NITRAS, B.

Nitrate of Lead. *F.* Nitrate de Plomb. *G.* Salpetersaures Bleioxyd.

Prop.—Nit. Lead (PbO, NO_5) crystallises in octohedral and tetrahedral crystals; and is soluble in about 4 parts of water. It increases the combustion of burning fuel when thrown upon it, and is reduced to the state of metallic Lead. Heated, it evolves the fumes of Nitrous gas; Oxide of Lead being left. It is now officinal in the B. P. 1867.

Prep.—With the aid of gentle heat saturate *dilute Nitr′* Oj. with *Litharge* ℥ivß. Filter and set aside to crystallise. Concentrate the remaining liquor to obtain more crystals.

Action. Uses.—It acts as the other preparations of Lead. It is contained in M. Ledoyen's *Disinfecting Solution.* Used in preparing Plumbi Iodidum, B.

PLUMBI ACETAS, B.

Acetate of Lead. *Plumbi Superacetas. Saccharum Saturni. Sugar of Lead. F.* Acetate acide de Plomb. *G.* Bleizucker.

Acet. Lead ($PbO, C_4H_3O_3, 3HO = 189{\cdot}5$) seems to have been known at least since the cultivation of chemistry in the middle ages.

Prop.—It is of a white colour, and of a sweet astringent taste, with a smell of Vinegar. The crystals form brilliant needles, or small tetrahedral prisms terminated by dihedral summits, and usually occur in an agglomerated mass; unalterable in the air, except when it is very dry, when they slightly effloresce; soluble in 4 parts of water and in Alcohol. The watery solution is capable of dissolving a portion of Oxide of Lead, which converts it into a Diacetate of that metal. Heated, the crystals fuse in their water of crystallisation, which at a higher temperature is dissipated; the white mass which remains again melts, Acetic and Pyroacetic acids are given off, and a globule of Lead may finally be obtained. The Acet. may be partially decomposed by the Carb′ of the atmosphere, also by that contained in water; hence the hazy appearance when it is dissolved in it, and which may be removed by the addition of a little Acet′. It is decomposed by a number of acids, the Sulph′ causing the exhalation of the odour of Vinegar, also by the alkalies, numerous salts, infusion of Galls, most Vegetable principles, also Milk and Albumen. Comp. Pb O 58·9 + Ac′ 26·8 + Aq. 14·3 = 100.

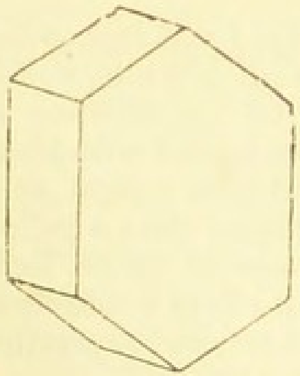

Fig. 28.

Prep.—B. Mix *Acetic acid* Oij. or q. s., and *Dist. water* Oj., add *Litharge* in fine powder ℥xxiv., and dissolve with the aid of a gentle heat. Filter, evaporate till a pellicle forms, and set aside to crystallise, adding a little Acetic acid should the fluid not have a distinctly acid reaction. Drain and dry the crystals on filtering paper without heat.

The Acetic acid is kept in slight excess to prevent the formation of the Subacetate, which contains twice as much of the Oxide as the neutral Acetate. The latter is frequently prepared by exposing Lead, half-immersed in Acet′, to heat and air. The Lead being oxidised or converted into the Carbonate, will, on falling into the Acet′, be formed into Acetate.

It is generally pure, but it has been known to contain Sulphate of Lead, from the use of impure Vinegar (containing $S\,O_3$) in its manufacture.

Tests.—Dissolved by distilled water. By Carb. Soda a white precipitate (Carb. Lead) is thrown down from the solution, and by Iodide of Potassium a yellow one (Iodide of Lead); by Hydrosul′ it is blackened (Sulphuret of Lead being formed). Sulph′ evolves Acetic vapours. By heat it first fuses, and is afterwards reduced to metallic Lead. If 100 gr. are dissolved in water, and Sulphate of Soda be added, 80 gr. of Sulphate of Lead are precipitated. 38 *gr. dissolved in water require for complete precipitation* 200 *measures of the volumetric sol. Oxalic acid.* (B.) The Oxalate of Lead is insoluble.

Inc.—Sulph′, H Cl, Carb′, Cit′, and Tart′; Lime water, Potash, and Soda; Hard water, from the salts contained in it.

Action. Uses.—A poison; Astringent and Sedative in profuse discharges and Hæmorrhages. (See page 189.) Lotion—ʒj.–℥v. or ℥viij. of fluid. Externally as an Astringent Collyrium and Wash.

Dose.—Gr. j. and ij.–gr. x., 2 or 3 times a-day, especially with dilute Acet′ or distilled Vinegar.

Antidotes.—Evacuate the stomach with Sulph. Zinc and warm diluents; give Sulph. Soda and of Magnesia, and Phosphate of Soda to render the Lead insoluble.

PILULA PLUMBI CUM OPIO, B. Pill of Lead and Opium. *Pilula Plumbi Opiata.*

Prep.—*Acetate of Lead*, in fine powder, gr. xxxvj.; *Opium*, in powder, gr. vj.; *Confection of Roses*, gr. vj. Beat into a uniform mass.

1 gr. in 8 of Opium. A pill of 4 gr. would contain 3 gr. of Acet. Lead, ½ gr. Opium. The pill is retained from the E. P. A chemical decomposition takes place to some extent in it, Acetate of Morphia being formed, and insoluble Meconate of Lead. (*See* Opium.)

Action. Uses.—A powerful combination for the arrest of hæmorrhages and discharges. In diarrhœa the astringent power of the Lead co-operates with the special constipating action of Opium.

Dose.—Gr. iv.–gr. viij.

UNGUENTUM PLUMBI ACETATIS, B. Ointment of Sugar of Lead.

Prep.—Mix thoroughly *Acetate of Lead* in fine powder, gr. xii.; and *Benzoated Lard*, ℥j.

Uses.—As a cooling application to burns, blisters, and irritable sores. From the L. P.

SUPPOSITORIA PLUMBI COMPOSITA, B. Compound Lead Suppositories.

Prep.—Take of *Acetate of Lead*, gr. xxxvj.; *Opium*, in powder, gr. xij.; *Benzoated Lard*, gr. xlij.; *White Wax*, gr. x.; *Oil of Theobroma*, gr. lxxx. Melt the wax and oil of theobroma with a gentle heat, then add the other ingredients previously rubbed together in a mortar, and having mixed them thoroughly, pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.

Introduced in 1867. Useful in piles, chronic dysentry, bleeding, and relaxed condition of lower bowel.

LIQUOR PLUMBI SUBACETATIS, B. Liquor Plumbi Diacetatis, L.

Solution of Subacetate or Diacetate of Lead. *Aqua Lithargyri Acetati.* *F.* Sous-acetate de Plomb. *G.* Halb-Essigsaures Bleioxyd.

Diacet. Lead ($2\,Pb\,O$, $C_4\,H_3\,O_3$) in the form of solution commonly called *Goulard's Extract*, was by Goulard himself called *Extract of Saturn*—that is, of Lead. It seems to have been known since the time of Basil Valentine, and owes its formation to the solution of Acetate of Lead dissolving a further proportion of the Oxide, and thus becoming converted into solution of the Diacetate of Lead.

Prep.—B. Boil *Acet. Lead* ℥v., and powdered *Oxide of Lead* ℥iijß in *Aq. Dest.* Oj., frequently stirring for half-an-hour. When cold add distilled water to make up Oj. Filter.

Prop.—Colourless, with a sweetish and sub-astringent taste, having an alkaline reaction on test-paper. By careful evaporation out of access of air, crystals may be obtained of a tabular form, or the salt in an uncrystallisable mass (dry Extract of Saturn, of Goulard). When exposed to the atmosphere, some Carb′ is absorbed and White Carb. of Lead is deposited; also on passing Carb′ gas into its solution, and this is one of the methods adopted in making Carb. Lead (q. v.) It is decomposed by common water. It precipitates mucilage and most vegetable colours. "It forms with mucilage of Gum-Arabic an opaque white jelly." (B.)

Tests.—Sp. Gr. 1·260. Same strength as the solution of the L. P. A copious precipitate is gradually formed when the breath is propelled through it by means of a tube. It becomes turbid on exposure to the air, and forms with mucilage of Gum-Arabic an opaque white jelly. The other properties are those of the Acet. Lead. When prepared with inferior Vinegar it is of a brown colour. ʒvj. *require for perfect precipitation* 810 *measures volumetric sol. Oxalic acid.* B.

Inc.—Acids, Alkalies, Earths, Alum, Borax, Tartarised Iron, and Antimony, Soap, Hard and Spring water, Sulphuretted Hydrogen, Mucilaginous solutions and drinks.

Action. Uses.—Astringent and cooling. *Externally*, diluted with water; or it may be used in a milder form, in the following preparation.

LIQUOR PLUMBI SUBACETATIS DILUTUS, B. Diluted Solution of Subacetate of Lead. Goulard water.

Prep.—B. Mix *Solution of Subacetate of Lead*, fʒij.; *Aq. Dest.* ℥xixß; *Rect. Spirit*, fʒij. (ʒj. of the above in ℥x.)

Useful as a soothing and astringent Collyrium or lotion.

UNGUENTUM PLUMBI SUBACETATIS COMPOSITUM, B. Ceratum, L. Compound Ointment or Cerate of Subacetate of Lead. *Goulard's Cerate. Ceratum Lithargyri Acetati.*

Prep.—B. Melt *White Wax* ℥viij. with *Almond Oil*, ℥xvj. on steam or water bath; remove from the fire, and when the mixture begins to thicken, add gradually *Sol. of Subacet. of Lead* f℥vj., stirring constantly till cool. Theu mix with these *Camphor* gr. lx., dissolved in *Almond Oil* f℥iv.

Action. Uses.—This is commonly called Goulard's Cerate, and forms a soothing, astringent, and sedative application for irritable surfaces and in chronic Ophthalmia.

BISMUTHUM, B.

Bismuth. *F.* Bismuth. *G.* Wismuth.

Bismuth (Bi = 210) is first mentioned by Agricola in 1520, having previously been confounded with Lead. It is usually met with in its metallic state, but also as an Oxide and a Sulphuret.

Prop.—Bismuth is of a reddish-white colour, devoid of taste or smell. It is brittle, of a lamellar structure, and readily crystallises in cubes or octohedra. Sp. Gr. 9·53–gr. 9·88. It melts at 497° Fahr. or 507° (Gr.), and volatilises at a full red heat. When exposed to the air, it tarnishes, but does not oxidate; at a high temperature it burns with a pale blue flame, when Teroxide of Bismuth ($Bi\,O_3 = 234$) is formed, and escapes in white fumes. Bismuth is with difficulty acted on by H Cl or by dil. Sul′, but readily by Nit′. (See *infra.*) As met with in commerce it is generally impure. The B. P. purifies it as follows:—

BISMUTHUM PURIFICATUM, B. Purified Bismuth.

Prep.—Take of *Bismuth*, ℥x.; *Nitrate of Potash*, in powder, ℥ij. Put the Bismuth and one ounce of the Nitrate of Potash into a crucible and heat them to a temperature at which both the metal and the salt are fused. Continue the heat, constantly stirring the contents of the crucible for fifteen minutes, or until the salt has solidified into a slag over the metal. Then remove the salt, add the remainder of the Nitrate of Potash to the Bismuth in the crucible, and repeat the process as before. Finally, pour the Bismuth while fused into a suitable mould, and allow it to cool.

Sulphur and Arsenic present in the impure metal are oxidised, and removed by the Nitre.

Tests.—Sp. Gr. 9·8. It is dissolved by Nit′ with the aid of heat; the solution is colourless; when Nitrate of Bismuth is precipitated from this solution by Ammonia, the liquor remains free from colour. It also deposits a white powder when much diluted with water.

Bismuthi Subnitras, B. Bismuthum Album, B. (1864.) Nitrate or Subnitrate of Bismuth. Trisnitrate of Bismuth. *Magistery of Bismuth. F.* Sousnitrate de Bismuth. *G.* Wissmuth weiss.

The Nitrate of Teroxide of Bismuth ($Bi\,O_3$, $N\,O_5$) is a tasteless powder of a brilliant white colour, and consists of microscopic needle-shaped crystals. There being much variation in opinion as to the constitution of this salt and the equivalent number of Bismuth, the B. P. (1864) called it by its old and incorrect name, and the B. P. 1867 regards it as a Subnitrate.

Prep.—B. Dilute *Nitric acid* ℥iv. with *Dist. water* ℥iij., and add *Bismuth* in coarse powder ℥ij. in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any particles of metal which may remain undissolved. Evaporate the solution till it is reduced to f℥ij., and pour it into half-a-gallon of *Dist. water*. When the precipitate which forms has subsided, decant the supernatant liquid, and agitate the sediment with another Cß of Water. After two hours, again decant, and having placed the product on a filter, dry it at a temperature not exceeding 150°.

In this process three different Nitrates of the Teroxide of Bismuth are concerned. These are, the officinal Nitrate (or Subnitrate), insoluble in water, containing 1 Eq. of acid to 1 of Teroxide ; the Ternitrate, containing 3 Eq. of acid to 1 of Teroxide, decomposed by water into the first and third ; and the Supernitrate, soluble in water, containing 9 Eq. of acid to 1 of Teroxide.

By the action of the strong acid the Ternitrate is first formed, 1 Eq. of Nitric′ yielding 3 Eq. of Oxygen to the Bismuth, so that Binoxide of Nitrogen escapes—

$$Bi + 4\,N\,O_5 = Bi\,O_3,\,3\,N\,O_5, + N\,O_2.$$

This salt, on being thrown into a large quantity of water, becomes decomposed into the insoluble Nitrate, which precipitates, and the soluble Supernitrate, which remains in solution.

4 Eq. of the Ternitrate produce 3 Eq. of the former and 1 of the latter salt. Thus,

$$4\,(Bi\,O_3,\,3\,N\,O_5) + 3\,H\,O = 3\,(Bi\,O_3,\,N\,O_5,\,H\,O) + Bi\,O_3,\,9\,N\,O_5.$$

Tests.—A heavy white powder, in minute crystalline scales, insoluble in water, blackened by H S. It is soluble in Nit′ without effervescence ; solution colourless. Dil. Sul′ being added to the solution, nothing is thrown down. The first indicates that no Carbonate is present, and the second the absence of Lead. The solution in Nitric acid, poured into water, gives a white crystalline precipitate.

The most serious impurity in Nit. Bismuth is *Arsenic*. Commercial Bismuth very frequently contains this metal, and the Nitrate prepared from it has been a serious source of error in medico-legal inquiries. Dr Herapath has discovered in some specimens of this preparation 1 gr. of Arsenic in 1000, in others as much as 1 in 433. The Arsenic may partly be dissipated by roasting the metal before dissolving it in $N\,O_5$, but it is not wholly got rid of in this way. It is not all removed by fusing with Nitre, as in B. P. Dr Herapath proposes to boil the Nitrate in solution of a caustic alkali, which removes the Arsenic, and converts the Bismuth into the insoluble oxide. This must now again be dissolved in $N\,O_5$, &c.

The *Oxychloride* and the *Carbonate* of Bismuth are sometimes substituted for the Nitrate, or mixed with it. The *Oxychloride* is used to make enamel, as a cosmetic, and for white sealing-wax. It is obtained when Aqua Regia is used instead of Nit. Acid in the above process. It is more apt to contain Arsenic than the Nitrate. The *Carbonate* is made by precipitating the strong solution of the Ternitrate with Carb. Soda, instead of pouring it into water. In this process none of the Bismuth is lost, whence it is frequently followed. The *Carbonate* is less crystalline than the Nitrate. It effervesces with acids, and is thought to be soluble in the stomach juices, and to act as an antacid in the same manner as chalk. It is recommended by some as preferable to the Nitrate. It is less likely to contain Arsenic. (*See* below.)

The Arsenic, when present, is supposed to exist as an Arsenite of Bismuth or of Lime. It may be detected by Marsh's test.

Action. Uses.—The Nitrate of Bismuth appears to be insoluble in the animal juices. It has not been proved that it ever undergoes absorption or passes into the fluids of the body. It may be given in very large doses without ill effect. But it is often of considerable use in Gastrodynia and chronic vomiting, caused by irritable conditions of the mucous membrane of the stomach, and it has been used with advantage in Diarrhœa depending on a similar cause in the intestine. Dr Headland conceives that it may operate in these cases by simply cloaking some of the delicate or irritable portions of the mucous surface with an insoluble white covering.

Dose.—Gr. v.–gr. xx.

TROCHISCI BISMUTHI, B. Bismuth Lozenges.

Prep.—Take of *Subnitrate of Bismuth*, gr. mccccxl., *Carbonate of Magnesia*, ℥iv.; *Precipitated Carbonate of Lime*, ℥vj.; *Refined Sugar*, ℥xxix.; *Gum-Arabic*, in powder, ℥j.; *Rose water*, q. s.; *Mucilage of Gum-Arabic*, ℥ij. Mix the dry ingredients, then add the mucilage, and form the whole into a proper mass with the rose water. Divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains two grains of Subnitrate of Bismuth.

These lozenges, introduced in 1864, form an elegant method of prescribing Bismuth.

Dose.—ii.–x.

BISMUTHI CARBONAS, B. Carbonate of Bismuth.

Like the Subnitrate, it is a tasteless, white, insoluble powder. Introduced in the B. P. 1867. It was first introduced by Dr Hannon of Brussels, who prepared it by a similar formula, used it in the same cases as the ordinary White Bismuth, but regarded it as a more efficient preparation. Its composition is stated in the B. P. to be $2\,BiO_3, CO_2 + HO$. Dr Hannon considered it a Subcarbonate.

Prep.—B. Take of *Purified Bismuth* in small pieces, ℥ij.; *Nitric acid*, f℥iv.; *Carbonate of Ammonia*, ℥vj.; *Distilled water*, a sufficiency. Mix the Nitric acid with ℥iij. of Distilled water, and add the Bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and afterwards decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to f℥ij, and add this in small quantities at a time to a cold filtered solution of the Carbonate of Ammonia in Oij of Distilled water, constantly stirring the mixture as it is formed. Collect the precipitate on a calico filter, and wash it with Distilled water until the washings pass tasteless. Remove now as much of the adhering water as can be separated from the precipitate by slight pressure with the hands, and finally dry the product at a temperature not exceeding 150°.

The soluble Ternitrate of Bismuth is first formed. This is decomposed by the Carb. Ammonia, Nitrate of Ammonia being formed, and insoluble Carbonate of Bismuth, which precipitates. This must not be dried at a high temperature, as it drives off CO_2, and leaves Oxide of Bismuth.

Tests.—Insoluble in water; soluble with effervescence in Nit. acid. Blackened by Sulph. Hydrogen. It does not discharge the colour of Sulphuric acid coloured with Sulphate of Indigo. (Test for Cl.) If as much as possible is dissolved in NO_5 diluted with half its volume of water, one volume of the solution will yield a white precipitate with twenty volumes of water. The Nit. acid solution gives no precipitate with dil. SO_3 (no Baryta or Lead), or with Nit. Silver (no Chlorides).

Action. Uses.—In Pyrosis, Gastrodynia, &c., as the Subnitrate. Probably decomposed by the acids of the stomach, with evolution of CO_2, but as the solution thus obtained would be again precipitated, there is no reason to suppose that it is absorbed.

Dose.—Gr. v.–gr. xx.

Liquor Bismuthi et Ammoniæ Citratis, B. Solution of Citrate of Bismuth and Ammonia.

Prep.—B. Take of *Purified Bismuth*, gr. 430; *Nitric acid*, f℥ij.; *Citric acid*, ℥ij.; *Solution of Ammonia* and *Distilled water*, a sufficiency. Mix the Nitric acid with an ounce of Distilled water, and add the Bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to f℥ij., then add the Citric acid previously dissolved in f℥iv. of Distilled water, and afterwards the solution of Ammonia in small quantities at a time until the precipitate formed is redissolved, and the solution is neutral or slightly alkaline to test-paper. Dilute with Distilled water to the volume of Oj.

Introduced in 1867. It differs somewhat from Schacht's solution of Bismuth, and the solution of the Ammonio-Citrate, a formula for which was published by Mr Squire in 1864. The solution of the Ternitrate is first obtained. This would be precipitated by Ammonia, but the oxide thrown down is soluble in Citrate of Ammonia. Mr Squire's preparation was prepared by thus dissolving the washed precipitate. In the B. P. the Nitric acid is retained, so that the solution in all probability contains the Nitrate and Citrate of both Bismuth and Ammonia. The supposed Ammonio-Citrate of Bismuth is not known as a definite salt, and cannot be obtained in the solid form.

This is preferred by some as being a soluble preparation of Bismuth. The Sp. Gr. of the solution is 1·122. Each fluid drachm contains 3 gr. of Oxide of Bismuth. It has a saline and slightly metallic taste. It is neutral or slightly alkaline to test-paper. It mixes with water without change. If heated with KO, it is precipitated, and evolves Ammonia. With HCl it gives a white precip. sol. in excess. ℥iij. with HS give a black precip., which when dried weighs 9·92 gr. (B.)

Action. Uses.—It resembles the Subnitrate and the Carbonate.

As both acids and alkalies decompose it, it can hardly pass unchanged into the blood. Its action, as that of the others, is probably local.

Dose.—ʒß–ʒj.

STANNUM. (B. Appendix.)

Tin. *F.* Etain. *G.* Zinn.

Tin (Sn=59) is one of the most ancient known of the metals, being mentioned by Moses under the name Bedel. It was used by the Egyptians, probably obtained from the East by the trade with India. The Greeks and Romans obtained it through the Phœnicians from England. It abounds in Cornwall, and in the East from Mergui to the island of Banca. It occurs both as an Oxide and as a Sulphuret, but chiefly the former, which is easily reduced to a metallic state by being heated with Charcoal, which abstracts its Oxygen. It is brought into commerce in the form of Grain Tin and Block Tin. Malacca Tin and Banca Tin are the Eastern varieties; to these Mergui Tin has lately been added.

Prop.—In mass, bluish-white, tarnishing but slightly, of a peculiar odour when rubbed; so malleable as to allow of being beaten into *sheet-tin* and *tin-foil;* soft, fusible; Sp. Gr. 7·29; that of commercial specimens is often higher, from the impurities which they contain. It fuses at 442°, and then becomes covered with a grey crust of the Oxide; burns at a red, and is volatilised at a white heat.

Tests.—Tin, boiled with H Cl, is almost entirely dissolved, a Protochloride being produced; the solution is colourless, but becomes purple on the addition of Chloride of Gold: the precipitate by Potash is white; when this is added in excess, the precipitate is redissolved. Hydro-sulphuric acid gives a brown precipitate. Granulated Tin is used as a test by the B. P. The Chloride is also used as a test for Gold. The powder, *Pulvis Stanni,* made by sharply triturating the fused metal, has been employed as an Anthelmintic in doses of ʒj.–℥ß, mixed with Treacle. It seems to kill the worms by mechanical irritation. *Tin-foil,* which is largely used by druggists to wrap up medicines and form capsules for bottles, is an alloy of tin and lead, containing from 25 to 75 per cent. of the latter metal, which is dangerous on account of the ease with which it is corroded. The so-called Tin-foil may be analysed by treating it with $N O_5$, when the lead is dissolved as a Nitrate, and an insoluble Peroxide of Tin remains. (P. J. Dec. 1861.)

CADMIUM.

Cadmium (Cd=56) was discovered in 1817 by Stromeyer in the investigation of some oxides of Zinc of a yellow colour. The ores of Zinc are the sources of this metal, which is contained in English Calamine, in the sulphuret called Black Fibrous Blende in Bohemia, and in metallic Zinc of commerce. To separate it from the Zinc, a solution in Hydrochloric acid is treated with Carb. Ammonia in excess, which dissolves the Zinc (and Copper) first precipitated, and leaves the Carbonate of Cadmium as an insoluble residue. It is easily reduced, by heating with charcoal or lamp-black, when the Cadmium sublimes, and condenses in metallic globules. It much resembles Tin, but is harder and tougher. It crackles when bent. Sp. Gr. 8·6. It is easily fused, and sublimed at a heat below redness. Its vapour is inodorous. It is not acted on by air in the cold, but if kept near melting-point, it forms an orange-coloured oxide, which is not volatile. Cadmium dissolves in dil. SO_3 or HCl, with the evolution of Hydrogen. Alkalies throw down from this solution a white hydrated oxide, which is soluble in excess of Ammonia, but not in the fixed alkalies or Carb. Ammonia. HS gives a yellow precipitate insol. in NH_3.

The salts of Cadmium are astringent, like those of Zinc. They are said to be alterative, and have been recommended in syphilis. The sulphate is used, like that of Zinc, in epilepsy, and its solution has been employed by Guibourt and others (2 gr. in 3 oz.) in chronic Ophthalmia, and to remove specks on the Cornea.

Cadmii Iodidum, B. Iodide of Cadmium.

($CdI = 183$). It may be made by heating Cadmium filings with Iodine, or by mixing them in requisite proportions (56 to 127) in the presence of water. By evaporating the solution in Alcohol or Water, it may be obtained in six-sided tables. It is commonly seen in flat micaceous scabs, white, and of a pearly lustre, like fragments of spermaceti. Heated to 100° they melt into an amber-coloured fluid. At a dull red heat they give off violet vapours (Iodine). CdI is anhydrous. It is freely soluble in water and Alcohol. The solution reddens Litmus paper. It gives a yellow precip. with HS or Sulph. Ammonium, insol. in excess of the latter. It gives a white precip. with Potash in excess, and the filtered solution is unaffected by Sulph. Ammonium. (Test for Lead.) 10 gr. precipitated with Nit. Silver yield 12·5 gr. of dried Iodide of Silver.

Action. Uses.—It is alterative and astringent. In large doses, emetic and poisonous. Seldom used internally.

Unguentum Cadmii Iodidi, B. Ointment of Iodide of Cadmium.

Prep.—Mix thoroughly gr. 62 of *Iodide of Cadmium* in fine powder with *simple Ointment* ℥j.

Introduced in 1867. It has been recommended by Dr Garrod and others as an application to scrofulous swellings and enlarged joints. It does not stain the skin. It may also be applied (in a more diluted form) to the edges of the eyelids in chronic Ophthalmia.

ANTIMONIUM.

Stibium. Antimony. *F.* Antimoine. *G.* Antimon.

Metallic Antimony ($Sb = 122$) is not officinal; but as so many of its preparations are employed, it is desirable to be acquainted with its characteristics. It was probably known to the Alchemists; but Basil Valentine (*Currus Triumphalis Antimonii*) made known the method of obtaining it. The Tersulphuret (q. v.) has been known from the most ancient times. Native Antimony occurs in France and Germany; the other ores are Oxide or White Antimony; Sulphuret, or Grey Antimony; and Sulphuretted Oxide, or Red Antimony. The Sulphuret is the most abundant ore, and that from which the metal is chiefly obtained. The latter used to be called Regulus of Antimony, and the Sulphuret, Crude Antimony. Antimony is obtained by heating the Sulphuret with half its weight of Iron filings or small Iron nails, when the Sulphur unites with the Iron, and the Antimony is set free. The melted Antimony collects in the bottom of the crucible, and may be run into moulds.

Prop.—A bluish-white metal, usually lamellar in structure and brittle in nature. Sp. Gr. about 6·7. It fuses at a temperature of about 800°, above which it may be volatilised, and in cooling may be made to crystallise in rhombohedra. It undergoes little change in the air, the surface only becoming tarnished and partially oxidised. Heated to a white heat, and suddenly exposed to the air, it burns with a white light; the vapour which escapes condenses in white needle-like crystals of Teroxide of Antimony, which was formerly called *Argentine Flowers of Antimony.* Antimony is dissolved by H Cl with the aid of heat, Hydrogen being disengaged. The solution of the Terchloride of Antimony, on being added to water, deposits a white precipitate, formerly called *Powder of Algaroth;* and an orange-red one of Tersulphuret of Antimony on the addition of Hydrosul′ or an alkaline Sulphuret. Nit′ converts the metal into Antimonic acid, which is insoluble in the acid. There are three compounds of Antimony and Oxygen: Oxide of Antimony, Antimonious and Antimonic acids.

Action and Uses of Antimonial Comp. See *Tartar Emetic.*

ANTIMONII OXIDUM, B.

Antimonii Teroxidum. Teroxide, or Sesquioxide of Antimony. *Flowers of Antimony.* *F.* Oxyde d'Antimoine. *G.* Antimonoxyd.

Teroxide of Antimony ($Sb\,O_3=146$) occurs native in Bohemia and Hungary, and is called White Antimony. It is produced when Antimony is burnt in the air.

Prop.—As prepared below, the Oxide is white and tasteless; unalterable in the air, but becoming yellow by heat, and regaining its colour when cool. At a low red heat it fuses. By a full red heat it may, like the native Oxide, be fused into a yellow liquid and afterwards sublimed; as before the blowpipe, when needle-like crystals will be deposited. If fused and exposed to the air, more Oxygen is absorbed, and Antimonious acid ($Sb\,O_4$) is formed, which is not volatile, less easily fused, and more inert as a medicine. The Teroxide is insoluble in water, but soluble in H Cl, Tart′, and Acet′; also in Bitart. Potash, when Tartar Emetic is formed.

Prep.—The best mode of obtaining Teroxide of Antimony is that discovered by M. Hornung, and adopted, in a modified form, in the preparation of Tartar Emetic by the L. C.

Prep. B.—Pour *Solution of Chloride of Antimony* ℥xvj. into *Water* Cij., mix thoroughly, and set aside until the precipitate which forms shall have subsided. Remove the supernatant liquid by a siphon, add one gallon of *Distilled water*, agitate well, let the precipitate subside, again withdraw the fluid, and repeat the processes of affusion of Distilled water, agitation, and subsidence. To the precipitate add *Carbonate of Soda* ℥vj., previously dissolved in two pints of *Distilled Water*, leave them in contact for half-an-hour, stirring frequently, collect the deposit on a calico filter, and wash with boiling Distilled water until the washings cease to give a precipitate with a solution of Nitrate of Silver acidulated by Nitric acid. Lastly, dry the product at a heat not exceeding 212°.

When a solution of Terchloride of Antimony ($Sb\,Cl_3$) is poured into water a great part of the Terchloride is decomposed. Cl unites with H of water, forming Hydrochloric acid; and the O of water being set free unites with the Antimony, forming a Teroxide ($Sb\,O_3$). This, being insoluble, precipitates along with some undecomposed Terchloride, forming with it an Oxichloride, the *white Powder of Algaroth*. This is separated by filtration, and washed free from acid. It is then washed with a weak solution of Carbonate of Soda. This decomposes the Terchloride (forming $Na\,Cl$, while $C\,O_2$ escapes), so that now only Teroxide remains. It is dried over a water-bath. This formula of preparation is from the E. P.

(The Subsulphate obtained in the L. formula for Tartar Emetic may be in the same way decomposed into Oxide by Carb. Soda.)

Tests.—Readily soluble in $H\,Cl$. This solution, poured into water, gives a white deposit, turned orange by $H\,S$. The Oxide yields no sublimate when fused in a test tube (no Arsenic). It dissolves entirely when boiled with an excess of Acid Tartrate of Potash.

Action. Uses.—Emetic, Diaphoretic, Expectorant. A good substitute for Antimonial or James's Powder.

Dose.—Gr. iij.-gr. x. in powder or pill.

Pharm. Prep.—This Oxide forms the active ingredient in several officinal preparations, as Pulvis Antimonialis, Antimonium Sulphuratum, Tartar Emetic, Glass of Antimony, Kermes, and Golden Sulphuret.

Pulvis Antimonialis, B. Pulvis Antimonii Compositus, L. Antimonial Powder. James's Powder.

Few empirical medicines have attained more permanent celebrity than the Fever Powder of Dr James, commonly called James's Powder, sometimes distinguished in prescriptions as the Pulvis Jacobi verus. As it was found impossible to make the powder by following the patentee's directions, and chemical analyses having ascertained that it consisted of Phosph. Lime and oxidised Antimony, the London College adopted a formula suggested by Dr Pearson for the preparation of a substitute.

Prep. L.—Mix *Tersulphuret of Antimony* powdered ℔j. and *Horn Shavings* ℔ij. Put them into a crucible heated to whiteness, stirring constantly till vapours no longer arise. Pulverise the product, and put it into a proper crucible. Heat it with a gradually increasing heat, that it may continue white hot for two hours. Rub the residue to a very fine powder.

The Tersulphuret of Antimony, consisting of Sulphur and Antimony, and the horn shavings, of Phosph. Lime cemented by gelatinous matter, become changed by the action of heat. The Sulphur, obtaining Oxygen from the air, escapes as Sulphurous acid; the Antimony being also supplied with Oxygen from the air, is converted into Antimonious acid, and into a small portion, usually about 4 per cent., of Teroxide of Antimony. The animal matter of the horn is burnt off, and the earthy ingredients, or Phosph. Lime, with a small portion of Carbonate, remained intermixed with the oxidised Antimony. During the second heating, some of the Teroxide formed becomes converted into more of the Antimonious acid, a little of which, combining with the Lime of the Carbonate, forms some Antimonite of Lime.

Prep.—B. Mix thoroughly *Oxide of Antimony* ℥j., and *Precipitated Phosphate of Lime* ℥ij.

The preparation of the B. P. has the advantage of being uniform in composition, and in containing one part in three of the active ingredient, the Teroxide of Antimony. The L. Prep. was apt to contain very little of this, and was often nearly inert.

Prop.—The powder is white, insoluble in water, devoid of both taste and smell. H Cl, digested on it, gives an abundant orange precipitate with Hydrosul′. The H Cl dissolves the Terox. Antimony and some Phosph. Lime. After the precipitate of Tersul. Antimony, if this be separated by filtering, and the solution boiled to expel any traces of Hydrosul′, a white precipitate (*Subphosph. Lime*) is thrown down on the addition of caustic Ammonia. (*James's Powder*, and its imitation in the L. P., contain Antimonious acid (inert ?) and Antimonite of Lime. If boiled in water the latter is dissolved, and the water gives an orange precipitate with H S, and white with Oxalate of Ammonia.)

If the efficacy of the old Antimonial powder consisted simply in the proportion of Teroxide which it contained, the new preparation must be not only far more valuable, but much more active. According to Mr Phillips, the L. powder contained no Teroxide at all, but only Antimonious acid (35 to 38 per cent.) and Phosph. Lime. He asserted the same of James's Powder, in which he found 56 per cent. of the acid. As these preparations have obtained some credit as febrifuges, it would appear that Antimonious acid cannot be so absolutely inert as some have supposed. Dr Maclagan, however, has found as much as 3·98 of the Teroxide in the Pulv. Antim. Co., L., and Mr Brande, in one specimen, 5 per cent. In the B. Prep. there is 33·3 per cent. ; the Phosph. Lime, having no febrifuge action, and being nearly inert, serves to dilute the Antimony.

Action. Uses.—Diaphoretic, in large dose emetic. Being much more slowly dissolved than Tartar Emetic, the Terox. Antimony is less likely to irritate or cause vomiting.

Dose.—Gr. ii.-gr. v. Much more active than James's Powder, of which 100 gr. have been given without any effect. Tartar Emetic, in small doses, may be used as a substitute, and is often far more efficacious.

Liquor Antimonii Chloridi, B. Solution of Chloride (Terchloride) of Antimony.

Terchloride of Antimony ($Sb\,Cl_3 = 228{\cdot}5$) is the Butter of Antimony of the old writers. It is a soft solid, liquefying at a gentle heat. It is employed for making the Teroxide, and has been recommended as a powerful caustic. In the B. P. 1867 these preparations are now termed simply Chloride and Oxide.

The B. P. employs a strong solution, which is precipitated by the addition of water. (*See* Antimonii Oxidum.)

Prep.—B. ℔j. of *Black (Sulphuret of) Antimony* is dissolved in *commercial Hydrochloric* Oiv., by the aid of a gentle heat gradually increased to ebullition. The liquid is filtered until quite clear; boiled down in another vessel to the bulk of Oij.; cooled, and preserved in a stoppered bottle. The solution has a Sp. Gr. of 1·470.

The $Sb\,S_3$ is decomposed by the H Cl. The Chlorine of the acid, 3 Equiv., combines with the metal, forming a Terchloride. The 3 Equiv. of Hydrogen combine with the Sulphur to form Sulphuretted Hydrogen gas, which escapes, and is got rid of by placing the vessel under a flue with a good draught—

$$Sb\,S_3 + 3\,H\,Cl = Sb\,Cl_3 + 3\,H\,S.$$

The neutral Terchloride is instantly decomposed by water, according to Wittstein. For this reason the H Cl is used in excess, as it enables the salt to dissolve in this quantity of water without decomposition. The B. P. uses 2 parts of the Sulphuret to 10 of acid. Wittstein recommends 2 parts to 8, with 1 part of Nitric acid. In the B. Prep. half of the water which dissolved the H Cl serves to dissolve the Terchlor. Antim. By distilling off more of the water, "Butter of Antimony" is obtained. The Pharm. product is a heavy liquid of a yellow or yellowish-red colour. A little of it dropped into water gives a white precipitate (Oxichloride). This, treated with H S, turns orange. Tartaric acid redissolves this precipitate. "ʒj. of the solution, with ¼ oz. Tart. acid and 4 oz. water, forms a clear solution which, treated with H S, gives an orange precipitate ($Sb\,S_3$) weighing, when washed and dried at 212°, 22 grains." B.

Action. Uses.—Butter of Antimony is an energetic caustic. It spreads like Caustic Potash, and must be used with the same precautions. It has been recommended for poisoned bites, and for Staphyloma of the Eye.

This solution is used in the preparation of the Teroxide and of Tartar Emetic.

ANTIMONIUM NIGRUM, B. ANTIMONII TERSULPHURETUM.

Native Tersulphuret of Antimony. *Antimonium Crudum.* Black or Grey Antimony. *Antimony.* *F.* Sulfure d'Antimoine. *G.* Dreifach Schwefel Antimon.

Sulphuret of Antimony ($Sb\,S_3 = 170$) is extensively diffused, being found in Hungary, at Borneo, Moulmein, and Pegu, in Persia and in Caubul. It has been employed from time immemorial in Asiatic countries for painting the eyebrows and eyelids. It is the στιμμι and Stibium of the ancients. By fusion in a covered crucible it is separated from many impurities, and then called Crude Antimony.

Prop.—*Crude Antimony* is in roundish dark-coloured loaves, which, when fractured, exhibits its peculiar and brilliant striated texture, and dark grey colour, often presenting some prismatic crystals. Sp. Gr. 4·6. It is readily reduced to powder, which is blackish, without taste and smell, but with a reddish hue when the Tersulphuret is very pure; insoluble in water; permanent in the air; fused at a moderate temperature, and volatilised in close vessels. Heated in the air, some Sulphurous acid is formed, as well as impure and mixed Oxides of Antimony. It is soluble in solution of Potash or Soda (*see* Antimonium Sulphuratum); also in $\mathrm{H\,Cl}$. It may also be dissolved in Nit′, which, parting with its Oxygen to both the metal and the Sulphur, converts the one into an Oxide and the other into Sul′; and these, combining together, form a Sulphate of Antimony, which is dissolved in the remaining Nit′.

Tests.—Seldom quite pure, being apt to contain some of the Sulphurets of Iron, Arsenic, Lead, and Copper. The B. P. directs that it be "purified from siliceous matter by fusion, and then reduced to fine powder." It gives the solubility in boiling $\mathrm{H\,Cl}$ as a sufficient test of its purity. The solution when obtained will deposit on dilution the white Oxychloride; while the clear liquid, still containing Antimony, will give an orange precipitate with $\mathrm{H\,S}$. Any Iron or Arsenic will disappear in the P. processes in which this ore is used. The Iron will give a yellow tinge to the solution in $\mathrm{H\,Cl}$, and both lead and copper may be detected by their tests after the precipitation of the Antimony. The Arsenic may also be tested by reducing it with a mixture of Charcoal and Carb. Soda, or by heating together equal parts of the Tersulphuret and Cream of Tartar for three hours, when an alloy is formed of Potassium and Antimony. This, when added to water, decomposes it: Hydrogen combined with Arsenic, or Arseniuretted Hydrogen, escapes, which, being tried with Marsh's test, the Oxide or a stain of metallic Arsenic is obtained.

Action. Uses.—Almost inert, but uncertain, as it may be more or less oxidised by acid in the stomach.

Antimonium Sulphuratum, B. Antimonii Oxysulphuretum, L. Antimonii Sulphuretum Aureum. Antimonii Sulphuretum Præcipitatum. Sulphurated Antimony, Oxysulphuret, and Golden Sulphuret. *Sulphur Antimonii Præcipitatum.* *F.* Soufre doré d'Antimoine. *G.* Goldschwefel.

Several Sulphurets of Antimony have long been employed in medicine. The present was known to Basil Valentine. Kermes Mineral is considered to have been discovered by Glauber, and made known through one of his pupils to La Ligerie, from whom, in 1720, the French government bought the secret of its preparation.

The precipitated Sulphuret, or Oxysulphuret, may be formed in several ways:—1. By boiling Sulphuret of Antimony with Carb. Potash or Soda. 2. With a caustic alkali. 3. By melting at a red heat a mixture of Sulphuret of Antimony and an Alkaline Carbonate, and then treating the melted mass with boiling water. The Sulphuret, when boiled in a solution of Alkali, becomes dissolved; but, on cooling, a reddish-brown powder is deposited, which is considered to be similar to the Kermes Mineral of old authors. But if we add an acid before the deposit takes place on cooling, an orange-red precipitate is produced, which is the officinal preparation, and supposed to be analogous to the Golden Sulphuret of the older Materia Medica. As the name Oxysulphuret seems to imply a definite composition, the B. P. entitles this *Antimonium Sulphuratum*, which, if it means anything, should be applied to the pure Tersulphuret. It describes it as a Tersulphuret with a variable proportion of Teroxide of Antimony. It would have been better, if this be the case, either to have omitted this old preparation entirely, or to have replaced it by something definite, as has been done with Antimonial Powder. The B. P. retains the formula of preparation as given in the L. P.

Prop.—A powder of an orange-red colour, devoid of smell, and with little taste. It is insoluble in water, but soluble, with the aid of heat, in alkalies. Acted on by H Cl or Nitro-H Cl, it becomes dissolved, with the exception of a little Sulphur. Heated in a tube, Sulphur sublimes; in the air it burns with a blue flame, with evolution of Sulphurous acid gas, leaving as a residue the oxidised metal. It is probably a mixture of the Tersulphuret and Teroxide of Antimony in certain proportions, although Dr Pereira doubts the presence of the latter, and cannot discover any crystals of it by the microscope. Mr Phillips dissolved out 12 per cent. of the Oxide from the L. Prep. by boiling it in a solution of Bitartrate of Potash. He considered the preparation to consist of 1 Eq. of $Sb\,O_3$, 5 of $Sb\,S_3$, and 15 of water. It is curious that the Equiv. of Sulphur and of water should be equal in number.

Prep.—Mix *Black Antimony*, ℥x., with *Liquor Sodæ*, Oivß; boil for two hours, continually stirring, and adding *Dist. water* that it may fill up the same measure. Strain the solution, and pour in gradually *dil. Sulph. acid* till in slight excess. Collect the precipitate on a calico filter, wash with *Dist. water* till the washings no longer precipitate with Chlor. Barium, and dry at a heat not exceeding 212°.

It seems that when the Tersulphuret is boiled with the solution of Soda, an exchange of elements first takes place. By this some Teroxide of Antimony and Sulphuret of Sodium are formed. The latter dissolves some unchanged Tersulph. Antimony, by forming with it a soluble double Sulphuret. Again the Teroxide of Antimony is held in solution by some undecomposed Soda, with which it forms a kind of Salt. Both of the compounds thus formed are again decomposed by the addition of $S\,O_3$.

Sulphate of Soda, Oxysulphuret of Antimony (hydrated), and perhaps some H S, are formed. The Oxysulphuret precipitates.

$$(Sb\,S_3,\ Na\,S) + S\,O_3 + H\,O = Na\,O,\ S\,O_3 + Sb\,S_3 + H\,S$$

and,

$$(Sb\,O_3,\ Na\,O) + S\,O_3 = Na\,O,\ S\,O_3 + Sb\,O_3.$$

Tests.—12 times its weight of H Cl, aided by heat, will dissolve most of it, forming a colourless solution, and leaving a little Sulphur. It is completely sol. in boiling Liq. Potassæ. "60 gr. dissolved in H Cl, and dropped into water, give a white precipitate, which, when washed and dried, weighs about 53 grs." (B.)

Action. Uses.—Alterative, but uncertain; in large doses, Emetic.
Dose.—Gr. j.–gr. v.

Pharm. Prep.—Pilula Hydrarg. Subchlor. Comp., or Plummer's Pill.

ANTIMONIUM TARTARATUM, B. Antimonii Potassio-Tartras, L.

Tartrate of Antimony and Potash. Potassio-Tartrate of Antimony. Tartarised Antimony. Tartar Emetic. *F.* Tartre Émètique. *G.* Brechweinstein.

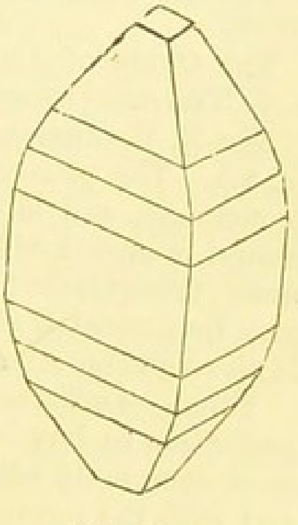

Fig. 29.

The discovery of this salt is attributed to Mynsicht (Thesaurus, &c., Hamburgh, 1631). It is a Tartrate of Potash and Teroxide of Antimony, and was at first made with Cream of Tartar and Liver of Antimony. As this salt is of definite composition, there appears to be no excuse for the adoption of a meaningless and unscientific name, as in the B. P.

Prop.—Tartrate of Antimony and Potash ($Sb\,O_3,\ K\,O,\ C_8\,H_4\,O_{10},\ 2\,H\,O = 343$), or Tartar Emetic, is usually seen as a white powder, but it crystallises readily from a saturated solution, in tetrahedra, or in octohedra with rhombic bases. They are colourless and transparent, without smell, but have a nauseous, styptic, and slightly acid taste. Exposed to the air they become opaque, and covered with a white powder, losing 4 or 5 parts per cent. of weight. The crystals are insoluble in Alcohol, but soluble in proof Spirit and in Wine, also in about 14 times their weight of temperate and about twice their weight of boiling water. The solution reddens Litmus, and, when diluted, soon undergoes decomposition. Heated, the crystals decrepitate, become charred, and leave a pyrophoric alloy of Antimony and Potassium. The solution is decomposed by the alkalies and alkaline earths, as well as their Carbs. (hence common water, containing Carb. Lime or of Magnesia, precipitates the Oxide Antim.); likewise by strong acids. If Tartaric acid is first added, no precipitate is formed with H Cl. (B.) Hydrosul' throws down the Antimony in the form of an orange-red precipitate of Hydrated Tersulphuret, as do also the Hydrosulphates of Ammonia and of Potash. The juices of many plants and astringent decoctions throw down the Oxide of Antimony as an insoluble compound. So much is this the case, that powder of Cinchona and of Galls, or a decoction of the latter, will prevent the emetic effects of Tartarised Antimony. The decoctions of Cinchona, Kino, and Rhatany, only partially neutralise its effects.

The Tartrate of Potash and of Antimony is composed, in Equivalents, of

1	Eq. of Tartaric acid	$=C_8H_4O_{10}$	$=132$
1	Eq. of Potash	$=KO$	$=47$
1	Eq. of Terox. Antim.	$=Sb\,O_3$	$=146$
2	Eq. of Water	$=2\,H\,O$	$=18$
			343

$Sb\,O_3$ occupies the same place in this salt as $Na\,O$ and $Fe_2\,O_3$ in the Potassio-tartrates of Soda and Iron. (q. v.)

Prep.—B. Mix *Oxide of Antimony* ℥v. and *Acid Tartarate of Potash*, in fine powder, ℥vj. with sufficient *Distilled water* to form a paste, and set aside for twenty-four hours. Then add *Dist. water* Ojß, and boil for a quarter of an hour, stirring frequently. Filter, and set aside the clear filtrate to crystallise. Pour off the mother liquor, evaporate to one-third, and set aside that more crystals may form. Dry the crystals on filtering paper at the temperature of the air.

The Oxide of Antimony takes the place of the basic water in the Acid Tartrate (Bitartrate), which consists of [KO, HO, $C_8\,H_4O_{10}$].

The B. P. obtains the oxide by the precipitation of the Terchloride (q. v.) The process of Hornung, imitated in the L. P., was more economical, and is generally followed by manufacturers. The Sulphuret is heated with SO_3 to form a Tersulphate. This, thrown into water, precipitates a Subsulphate of Antimony ($2\ Sb\,O_3$, $S\,O_3$). This may be presented at once to the solution of Tartar, $S\,O_3$ remaining in the solution after the salt has crystallised out.

Tests.—As Tartar Emetic in powder is apt to be adulterated, it is preferable to buy it in well-formed crystals. In this country it is most commonly adulterated with Bitart. Potash and Oxide of Iron, and with the former more frequently ; the latter gives it a yellow tinge. It decrepitates and blackens upon the application of heat. It is totally soluble in water, and with this solution Ferrocyanide of Potassium gives no precipitate, but H S produces an orange precip. of Tersulphuret. Nit′ precipitates the oxide, which is soluble in an excess of the acid. Neither Chlor. Barium nor Nit. Silver precipitates anything but what is dissolved by the addition of water (no Sulphates or Chlorides). "20 gr. dissolve without residue in ℥j. of Dist. water at 60°, and the solution gives with H S a precipitate, which, when dry, weighs 9·91 gr." (B.)

Inc.—Acids, alkalies, and their carbs. ; some of the earths, and metals, and their oxides ; Lime water, Chlor. Calcium, and Acetates of Lead ; vegetable infusions and decoctions, as of Cinchona, Catechu, &c. The solution of Tart. Emetic in water is liable, if kept long, to undergo decomposition, with the formation of a peculiar fungus. This is prevented by the addition of spirit.

Action. Uses.—Tartar Emetic, externally applied, is rubefacient and irritant. Its application, as in the form of ointment, is succeeded by an eruption of pustules. It is used in this manner as a counter-irritant in chronic affections of the chest and joints.

For internal use this is the best and most active of all the antimonial preparations. Its operation varies with the dose given. In a very small dose it is diaphoretic and expectorant. In a larger dose it excites nausea, causing at the same time great depression, cold sweating, relaxation of the muscular system, with slowness and weakness of the pulse. In a full dose it is emetic. Its operation is accompanied and succeeded by great nervous and vascular depression, often with purging. If the dose, at first small, be gradually increased, a considerable quantity may be given without causing vomiting. It is in this manner that it is advised to be given, by Laennec and others, as an antiphlogistic in Pneumonia and other acute inflammations. This medicine is thus capable of very wide application. As acting on the skin and lungs, small doses may be given in Coughs, Colds, and Rheumatic disorders. As a nauseant it is of use to prepare for the reduction of Dislocations and Herniæ, by relaxing the muscular system. As an emetic it may be given at the commencement of Bilious Fevers, or to cut short at its outset an acute local inflammation. It is of especial use in Ophthalmia. It aids the operation of purgatives. As an antiphlogistic it may be prescribed in Fevers, to relax the skin and lower the pulse; also in Acute Rheumatism. In Pneumonia and Croup it is invaluable. It should be avoided in Phrenitis, Apoplexy, Narcotic poisoning, and Peritonitis, as in these cases the occurrence of vomiting might be dangerous.

Dose.—Alterative, gr. $\frac{1}{16}$ to $\frac{1}{8}$. Diaphoretic and Expectorant, gr. $\frac{1}{8}$ to $\frac{1}{6}$. Nauseating Sudorific, gr. $\frac{1}{4}$ to $\frac{1}{2}$. Emetic, gr. j.–gr. ij. diluted. Contra-Stimulant, gr. j.–gr. iij. every 2 or 3 hours.

Antidotes.—Excite vomiting by mechanical irritation in the fauces, or with draughts of warm water; or use the stomach-pump. The best antidotes are astringent vegetable decoctions or infusions, as of Gall-nuts or of Cinchona, as these form insoluble Tannates with the Teroxide of Antimony.

VINUM ANTIMONIALE, B. Vinum Antimonii Potassio-Tartratis, L. Antimonial Wine.

Prep.—B. Take *Tartarated Antimony* gr. xl., dissolve it in *Sherry Wine*, Oj. Same strength as L.

Action. Uses.—Alterative, Diaphoretic, and Emetic.

Dose.—♏x.–fʒij. every 3 hours. Each f℥ contains 2 grs. of Tartar Emetic. f℥ß or f℥j. may be given in fʒj. doses, or a teaspoonful every 5 or 10 minutes, to act as an Emetic.

UNGUENTUM ANTIMONII TARTARATI, B. Unguentum Antimonii Potassio-Tartratis, L. Tartar Emetic Ointment.

Prep.—B. Take *Tartarated Antimony* in fine powder ℥¼, *Simple Ointment* ℥j. Mix thoroughly. Same strength as L.

Action. Uses.—Counter-irritant. Gr. xxx. applied twice a-day by friction on the skin, produces a pustular eruption. A valuable application in phthisis, chronic peritonitis, and other local inflammations of the chest and abdomen.

HYDRARGYRUM, B.

Argentum vivum et liquidum. Mercury. Quicksilver. *F.* Mercure. Vif-argent. *G.* Quecksilber.

Mercury (Hg=100), or Quicksilver, was known to the ancients. The Romans seem to have employed it as a medicine externally, as did the Arabs ; but the Hindoos were probably the first to prescribe it internally. It is found in China, at Almaden in Spain, and Idria in Carniola, likewise in South America. Immense mines of Quicksilver have been lately worked in California. It occurs occasionally in metallic globules ; usually as the native Sulphuret or *Cinnabar;* combined with Silver, forming a *Native Amalgam;* or with Chlorine, as in *Horn Mercury.* It is chiefly obtained from the Sulphuret by distillation with Lime or with Iron, which combining with the Sulphur, the metal distils over and is condensed.

Prop.—Mercury is remarkable among metals for existing as a liquid at ordinary temperatures, and for its silver-like colour and lustre. It is without taste or smell. Sp. Gr. 13·568. Freezes at − 40° ; crystallises in octohedra, becomes malleable, and has a Sp. Gr. of 14 from the contraction. It boils at 660°, and is converted into colourless vapour of great density. (According to Faraday, it is converted into vapour at ordinary temperatures.) It is unalterable in the air, except with the aid of heat, when it slowly combines with Oxygen, and forms the red oxide, and a greyish powder (Black Oxide or *Æthiops per se*), which is a Suboxide. By increase of heat, the Oxygen is again expelled. Mercury combines with Chloride and Bromine in two, and with Iodine in three proportions ; with Sulphur it forms a black and a red Sulphuret. It unites with several metals, especially Gold, Silver, Lead, Tin, Bismuth, Zinc, which it dissolves, and with which it forms amalgams. Cyanogen unites with it to form Cyanide of Mercury. All the acids combine with its Oxides and form salts, the Nitric acid most easily, even when diluted, and at ordinary temperatures. Solutions of Mercury may be decomposed by introducing into them a piece of clean copper, on which a thin layer of Mercury will become deposited. Sulphuretted Hydrogen will throw down a black Sulphuret of Mercury. Caustic Potash or Soda will give a grey precipitate with the salts of the Suboxide, and a reddish-yellow one with those of the Oxide. Ammonia, on the contrary, deposits double salts, as the Hydrarg. Ammonio-Chloridum. Most of these compounds will be treated of in the following pages.

Tests.—Mercury may be adulterated with Lead, Tin, Bismuth, &c., when it loses its lustre, especially if shaken. A globule moved along a sheet of paper should leave no trail, indicating that these are not present ; but pure Mercury, if moist, will form this trail.

Mercury of commerce should be strained, to free it from mechanical impurity. The Sp. Gr. should be 13·5 ; the metal entirely vaporisable. Pure Mercury is insoluble in cold Sulphuric and in boiling Hydrochloric acids. Thus neither of the acids, after this test, should leave any residue on evaporation. The several metals may be distinguished by their respective tests.

The Mercury of commerce is now usually pure enough for Pharmaceutic purposes ; but the B. P. (1864) had a formula for its purification.

Prep.—Commercial Mercury ℔iij.; distil ℔ijß. with a gentle heat. The product is boiled with *Hydrochloric* ℥iij., diluted with *Dist. water* ℥ix., well washed, and dried.

[There is a serious doubt as to the chemical equivalent of Mercury. It depends chiefly on the difficulty of establishing isomorphous relations between this and other metals. Many chemists, as Brande, Pereira, and Fownes, regarding the red oxide as the most stable of its compounds with Oxygen, assume it to be the Protoxide of Mercury. The grey oxide thus becomes the Suboxide or Dinoxide. The compounds with Chlorine follow the same rule. Corrosive Sublimate is the Chloride, Calomel the Subchloride of Mercury. The equivalent of Mercury will then be 100, as assumed in the B. P.

On the other hand, if we start from the compounds in which the metalloid is in lowest proportion, the grey oxide is a Protoxide, the red oxide a Binoxide, Calomel is the Chloride, Corrosive Sublimate the Bichloride of Mercury. The equivalent of Mercury is then 200. This was the view of the L. P., and it is one to which many chemists are now inclined. In the present imperfect state of knowledge as to this matter, it would have been better if no innovation had been made in the B. P. (1864) as to the nomenclature of the Salts and compounds of Mercury.]

Action and Uses of Mercurial Compounds.—The compounds of Mercury are very extensively used. To obtain the action of Mercury in a mild form we may employ Blue Pill, which contains the metal finely divided, as well as some Oxide ; or Calomel, an insoluble Chloride. The soluble Chloride is much more active and dangerous, being a corrosive poison. The above insoluble medicines are in some manner dissolved in the stomach or intestines, and pass thence into the blood. Mercurials tend to impoverish this fluid, diminishing the amount of Fibrine and Corpuscles, and thus counteracting all inflammations. For the same reason they promote absorption. In acute inflammations they arrest the process, in chronic cases they help to remove deposits. When the case is very urgent, Mercury is inferior to Antimony, being slower in its action. But its effect is more lasting, and it is of especial use in inflammations of the Pleura, Liver, and Brain, and in Gout and Rheumatism. When carried to the extent of producing salivation, it is known that the system is saturated with it, and it need not be persevered with.

Besides being thus useful in inflammations generally, Mercury is of very particular value in Syphilitic disorders, which it holds under special control. In primary cases, when the sore is not sloughing, or the constitution radically enfeebled, it is the best of all remedies. It is generally combined with opium, which prevents it from passing off by the bowels. In Syphilitic Iritis it is indispensable, but in Periostitis and other late affections it is inferior to Iodide of Potassium. These actions of Mercury in the blood are commonly classed together under the title of *Alterative*, which is peculiarly given to this remedy.

Mercury at length leaves the blood, and passes out by the glands, stimulating all the secretions. It is Diaphoretic, Diuretic, and Sialagogue; also Cholagogue and Cathartic. For this latter action it is commonly given, alone or with other purgatives, in those very frequent cases where an action upon the liver as well as on the bowels is desired. As a Cathartic in full habits of body, or in dyspeptic or gouty subjects, Mercury is of great service. It may be given to children with safety. Calomel and other mercurials have been largely given in Cholera; but their utility in this disorder is a matter of doubt. In Scrofula, Agues, and Anæmic disorders, they may do good by acting on the liver.

The preparations of Mercury are sometimes used externally. The Oxides, in the form of Black Wash and Yellow Wash, are applied to sores and eruptions of Syphilitic origin. Mercurial ointment, containing some of the Suboxide with a large amount of the metal itself, is extensively used as a stimulant and alterative application to the surface, and may produce by its absorption the remote action of a Mercurial. The Chloride forms an irritant or astringent lotion; still more diluted, a wash for Syphilitic eruptions. The ointment of the red oxide is used as an excitant to indolent ulcers, that of the Ammonio-chloride as a mild discutient application. And the ointment of the Nitrate is chiefly employed as a stimulant in tarsal Ophthalmia.

PREPARATIONS OF MERCURY.

Though Mercury, in its metallic state, is generally said to be inert, there are several valuable preparations in which the principal portion of it exists chiefly in that state. In these, the Mercury, by long trituration with dry powders, viscid confections, or greasy substances, gradually loses its fluidity and metallic lustre, and becomes what is called *extinct* or *killed*. It is, in fact, reduced to a dark grey mass, in which, when moist and well prepared, globules cannot be distinguished even with a magnifier of moderate powers. But although a portion of the Mercury is oxidised, the greater portion, though finely divided, is in a metallic state; for if rubbed on Silver or Gold, the white mercurial stain will readily be displayed.

HYDRARGYRUM CUM CRETA, B. Mercury with Chalk. *Grey Powder.* Mercurius Alkalizata.

Prop.—A heavy powder of a greyish colour; without smell; has a slight metallic and chalky taste; insoluble in water, but its Carbonate of Lime is readily acted on by acids.

Prep.—B. Rub *Mercury* by weight ℥j. and *Prepared Chalk* ℥ij. in a porcelain mortar until metallic globules cease to be visible to the naked eye, and the mixture acquires an uniform grey colour.

[Wholesale manufacturers generally mix the ingredients by rapid rotation in a cask turning on an axis.]

This preparation contains 1 part in 3 of metallic Mercury in a very fine state of subdivision, in which condition it seems capable of acting on the system. The L. Prep. contained about 3 parts of Mercury in 8. When heated strongly, nothing is left but Chalk. Digestion in Acetic′ dissolves the Chalk, leaving the Mercury. A minute portion of the metal probably becomes oxidised during the process of trituration, more particularly when water is added to the Chalk, as recommended by Mr Phillips, or when the Mercury is first rubbed with Manna, as ordered in the old edition of the D. P. Dr Nevins has proved that a little (about half-a-grain in 100 grains of the Hydrarg. c. Creta) is in the state of Suboxide. Dr N. dissolved away the Chalk with H Cl, and thus converted the Oxide, if any were present, into Subchloride of Mercury. After washing, the residue was digested in dil. Nit′ to remove metallic Mercury, and the white powder or Subchloride left. This became black when touched with Liq. Potassæ, &c. (P. J. iv. 412.)

Tests.—Part is evaporated by heat ; what remains is colourless, and totally soluble in Ac′ with effervescence : this solution is not coloured by Hydrosul′. The ingredients can scarcely be so diligently triturated as that no globules shall be visible.

Inc.—Acids and acid salts. Sulphates, Acetate of Lead.

Action. Uses.—Mild Alterative and Cathartic, also Antacid.

Dose.—Gr. v.–ʒß for adults ; gr. ij.–gr. v. for children, in powder or some viscid substance.

PILULA HYDRARGYRI, B. Mercurial Pill. *Pilula Cœrulea.* Blue Pill.

This forms a mass of a bluish colour and soft texture, in which most of the Mercury is minutely subdivided and a small portion oxidised.

Prep.—B. Rub together *Mercury* ℥ij. and *Confection of Roses* ℥iij., till metallic globules are no longer visible. Then add *Liquorice Root* in fine powder ℥j. Mix the whole well together.

Steam power is now usually employed, which is an advantage, as the efficacy of the pill depends upon the extent to which the extinction is carried. It has been proposed to effect this by means of Stearine, and then to add the Rose Confection. Mr Stoddart (P. J. xv. 322) recommends to extinguish the Mercury by triturating it with the liquorice powder first. This pill ought to display no globules when rubbed on paper. It contains 1 part in 3 of Mercury. Dr Nevins has shown, as in the case of the Hydrarg. c. Creta, that a small portion, about ¾ gr. in 100 grs. of the Pill, is in the state of an Oxide. (P. J. iv. 412.) If washed with boiling water, this ought to give no indications of Sul′ with Chloride of Barium, as this acid is sometimes added to heighten the colour of the Confection, by which a poisonous Subsulphate is produced.

Action. Uses.—Alterative, Cathartic. Employed to affect the system with Mercury, as in Syphilis and many inflammations.

Dose.—Gr. iij.–gr. v., or even gr. xv., to act as a purgative. Gr. v., morning and evening, are prescribed to induce salivation, sometimes conjoined with a little Opium, to prevent the Mercurial from acting on the bowels. 3 grs. of the Pill contain 1 gr. of Mercury.

UNGUENTUM HYDRARGYRI, B. Mercurial or Blue Ointment. *F.* Onguent Mercuriel.

Mercury in this form seems to have been employed medicinally by the Romans. Pliny says that Mercury is poisonous, "unless, indeed, it is to be administered in the form of an unction on the belly, when it will stay bloody fluxes." (Holland's Transl. lib. 33, c. 8.) It was subsequently employed by the Arabs, and thence reintroduced into European practice.

Prep.—B. Take *Mercury*, ℔j.; *Prepared Lard*, ℔j.; *Prepared Suet*, ℥j. Rub together until metallic globules are no longer visible.

Trituration produces extinction of the Mercurial globules, and with this some degree of oxidation. This has been denied by some skilful experimentalists; but, as it depends upon the mode and extent to which the trituration has been carried, the oxidation may not be observed when the trituration has been less effective. It has been ascertained that simple trituration is not sufficient, for globules continue to be observed with a magnifier of four or five powers. The complete extinction is best effected by the assistance of steam power, and by allowing the mixture to remain exposed to the air, triturating occasionally; so that the operation is not completed for some weeks. It has also been recommended to triturate the mixture with some old Mercurial ointment, or, as Soubeiran recommends, with Lard that has been exposed in thin layers in cellars from fifteen days to some months. It has lately been found that a small quantity of Sulphate or Nitrate of Potash will assist in the extinction of the Mercury.

M. Guibourt and Messrs Vogel and Boullay assert that, according to their experiments, the Mercury in the above ointment remains for the most part in a metallic state. M. Guibourt found only a 500th part of the ointment to consist of a Suboxide of Mercury combined with a fatty acid. Dr Christison, however, states that he has never failed to detect a sensible proportion of this Oxide. On melting the ointment in a long tube, there is obtained a short column of Mercury at the bottom, and a long superstratum of yellowish, almost perfectly transparent oil. This, even when filtered, becomes intensely black with Sulphuretted Hydrogen; and if agitated with successive portions of dil. Ac′ at 150°, an acid liquor is obtained, which gives a copious black precipitate of Subsulphuret of Mercury with the same reagent. Hence, Mercury must be present in the form of a Suboxide combined with a fatty acid, and (Dr C. calculates) in the proportion of about one per cent. of the ointment, or a fiftieth of the Mercury used. Mr Donovan many years since proved that the superior stratum of melted ointment contained only one-fifth of the original Mercury, but was as energetic as ever in producing the effects of Mercury. He therefore conceived it to consist partly of uncombined metal and lard, and partly of a chemical compound of the Suboxide and Lard: to the latter portion alone he attributed any medicinal efficacy. Dr Paris, long since, in his Pharmacologia, recommended the adoption of an ointment made with the Suboxide of Mercury. Dr Christison also concludes that the small portion of Oxide either present at first or formed during the process of rubbing the Ointment into the skin, is the only active part of the Mercury. Such is likewise the opinion of Dr Bærensprung (P. J. x. 554). It is probable that the formation of this active Suboxide of Mercury depends on the oxidation or rancidity of the fatty matter of the ointment.

Tests.—Mercurial Ointment is apt to be carelessly made, or with too little Mercury. Its colour should be compared with that of some genuine Ointment. Its Sp. Gr. (1·78) should be ascertained. When rubbed on paper, no globules should be visible with a magnifier of four powers; though innumerable ones may be seen with a powerful microscope (as represented in P. J. iii. 399). The fatty matter may be separated by means of boiling water or Ether, &c., and the residual Mercury weighed. Prussian Blue is sometimes added to heighten the colour.

Action. Uses.—Rubbed on the skin, or taken internally, affects the constitution with Mercury, as indicated by salivation. Useful dressing to Syphilitic and other sores.

Dose.—Contains equal parts of Mercury and Lard (with Suet). ʒß–ʒj. rubbed morning and evening, or more frequently, on the inside of the thighs or arms, or elsewhere, will speedily salivate. The patient should be kept warm and in the same clothing, the hand of the operator being protected with bladder, &c. On the Continent, gr. ij.–gr. v. made into pills with Liquorice are given internally to produce speedy salivation. The practice is worthy of adoption in extreme cases, especially in hot climates.

UNGUENTUM HYDRARGYRI COMPOSITUM, B. Compound Ointment of Mercury.

Prep.—Take of *Ointment of Mercury*, ℥vj.; *Yellow Wax* and *Olive Oil*, of each ℥iij.; *Camphor*, ℥iß. Melt the Wax with a gentle heat, and add the oil; then, when the mixture is nearly cold, add the Camphor in powder, and the Ointment of Mercury, and mix the whole thoroughly together.

Introduced in 1867. A weaker preparation than the last (less than ½ Mercury), but more agreeable in smell.

LINIMENTUM HYDRARGYRI, B. Compound Liniment of Mercury.

Prep.—B. Liquefy *Mercurial Ointment* ℥j. in *Liniment of Camphor* ℥j., with a gentle heat. Add gradually *Solution of Ammonia* ℥j., and mix with agitation.

Action. Uses.—A liquid form of Mercurial Ointment combined with stimulants, and, like the last two preparations, employed to promote absorption, and hence to discuss indolent tumours, &c.; sometimes to excite salivation more readily, by its stimulant action on the lymphatics. The Mercury is suspended in a kind of soap formed by the lard with the Ammonia.

Emplastrum Hydrargyri, B. Mercurial Plaster.

Prep.—B. Take of *Mercury*, ℥iij.; *Olive Oil*, fʒj.; *Sublimed Sulphur*, gr. viij.; *Lead Plaster*, ℥vj. Heat the oil and add the Sulphur to it gradually, stirring until they unite; with this mixture triturate the Mercury until globules are no longer visible, then add the Lead Plaster, previously liquefied, and mix the whole thoroughly. The L. Plaster contained $\frac{1}{5}$ Mercury, the B. Prep. contains nearly $\frac{1}{3}$.

This differs from the plaster of B. 1864, in containing a little Sulphur, as in the plaster of the L. P.

Action. Uses.—Applied as a plaster, it stimulates the lymphatics of the part, whether this be a chronically enlarged joint, a node, glandular enlargement, or chronically diseased liver or spleen.

Empl. Ammomiaci cum Hydrargyro, B. Plaster of Mercury and Ammoniac.

Prep.—B. Add *Sulphur* gr. viij. gradually to *Olive Oil* fʒj. previously heated, stirring till they unite. Triturate *Mercury* ℥iij. with these till the globules disappear. Add gradually *Ammoniac* ℥xij. melted. Mix carefully.

Action. Uses.—Similar in its effects to the last, but usually considered more effective. Applied to discuss enlargements of glands and joints, or to indolent tumours.

Suppositoria Hydrargyri, B. Mercurial Suppositories.

Prep.—Take of *Ointment of Mercury*, gr. lx.; *Benzoated Lard*, *White Wax*, of each gr. xx.; *Oil of Theobroma*, gr. lxxx. Melt the Benzoated Lard, Wax, and Oil of Theobroma with a gentle heat, then add the Ointment of Mercury, and, having mixed all the ingredients thoroughly, without applying more heat, immediately pour the mixture, before it has congealed, into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.

Introduced in 1867. Useful in Fistula, Piles, chronic Dysentery, and other diseases of the lower bowel.

Hydrargyri Suboxidum.

Suboxide of Mercury. Protoxide of some chemists. *Hydrargyri Oxydum cinereum.* *F.* Protoxide de Mercure. *G.* Quecksilberoxydul.

The Suboxide ($Hg_2 O=208$) of Mercury is a dark grey powder, devoid of taste and smell; heavy; Sp. Gr. 10·69; insoluble in water; easily decomposed by light, and by a heat even of 212°, being resolved into Metallic Mercury and some Oxide, when it becomes of a yellowish or olive hue. Dissipated at 600°. Readily dissolved by Acetic′ or by dil. Nit′, from which it will be again precipitated by the alkalies. Hydrochloric acid, or the soluble Chlorides, will give a white precipitate (Calomel) in solutions of its salts. These are also precipitated black by Potash or by HS; and the metal itself is precipitated on the introduction of a piece of clean Copper. It may be prepared by mixing Calomel with Lime water, when Chloride of Calcium is found in the solution, and the Suboxide of Mercury precipitated. It should be dried at a moderate heat, and kept from the light. A small portion of this Oxide has been detected in Hydrarg. c. Creta, Pil. Hydrarg., and Ung. Hydrargyri. Comp. Hg 96·2, O 3·8=100. This Oxide is not now officinal.

Action. Uses.—A mild Mercurial; but uncertain in composition, and therefore seldom if ever used internally. Mr Donovan recommended it to be employed for making Ung. Hydrargyri.

Dose.—Gr. j.–gr. v. Employed sometimes in fumigations. Externally as an Ointment, 1 part to 3 or 5 of Lard; or as a lotion in Black Wash.

LOTIO HYDRARGYRI NIGRA, B. Black Mercurial Lotion. *Black Wash.*

Prep.—Take of *Subchloride of Mercury*, gr. xxx.; *Solution of Lime*, f℥x. Mix.

Introduced in B. P. 1867, but long used in hospitals. Applied as a wash to Syphilitic ulcers.

HYDRARGYRI OXIDUM. HYDRARGYRI OXIDUM RUBRUM, B.

Oxide of Mercury. Red and Peroxide of Mercury. Binoxide of Mercury of some chemists. Nitrico-oxide of Mercury (L. P.) *Calcined Mercury.* *F.* Deutoxide de Mercure. *G.* Rothes Quecksilberoxyd.

The Red Oxide of Mercury ($HgO=108$) has long been employed in medicine, being one of the preparations which were known to Geber.

Prop.—Oxide of Mercury is an orange-red powder, without smell, but having a disagreeable metallic taste. Sp. Gr. about 11·0. Nearly insoluble in water. It is, however, soluble in boiling water to the extent of 1 grain in f℥xvj., or about a 7000th. (*c.*) Dr Barker found 0·62 parts soluble in 1000 of water. It is decomposed by light and heat, changing colour, and at a heat below redness giving out Oxygen, the Mercury becoming sublimed. It is readily dissolved by Nit′ and H Cl, also by Ac′ and Hydrocyanic′. Comp. Hg 92·7 + O 7·3=100.

It may be prepared by keeping metallic Mercury for some time at a heat of 600° in a narrow-mouthed vessel, when it undergoes oxidation, and becomes converted into red scales of Peroxide. Or the solution of Chlor. Mercury may be precipitated by Liq. Potassæ, and the Oxide thus obtained dried at a gentle heat—

$$HgCl + KO = KCl + HgO.$$

Or the Oxide of Mercury may be made by heating the Nitrate, as in the B. formula, which resembled that prescribed in the L. P. for the preparation of the "Nitrico-oxide."

Prep.—B. Take of *Mercury*, by weight, ℥viij., *Nitric acid*, f℥ivß; *Water*, f℥ij. Dissolve half the Mercury in the Nitric acid diluted with the Water, evaporate the solution to dryness, and with the dry salt thus obtained triturate the remainder of the Mercury until the two are uniformly blended together. Heat the mixture in a porcelain capsule with repeated stirring, until acid vapours cease to be evolved, and, when cold, enclose the product in a bottle.

The Nitrate of Mercury is first formed, part of the Nit. acid yielding 1 equiv. Oxygen to the Mercury, and Nitrous acid being evolved—

$$Hg + 2\,N\,O_5 = Hg\,O,\ N\,O_5 + N\,O_4.$$

Another equal quantity of Mercury is now rubbed up with the Nitrate, and the mixture heated, when the acid is decomposed by the second equivalent of the metal, and the Oxide remains as an orange-red powder—

$$Hg + Hg\,O,\ N\,O_5 = 2\,Hg\,O + N\,O_4.$$

The product is apt to be contaminated with some Nitrate of Mercury, especially if too much $N\,O_5$ be used. The Nitrate when heated gives off $N\,O_4$. Hence the oxide may be tested by heating it in a test tube, when no orange-red vapour should be evolved.

Mr Brande recommends, on the large scale, the proportion of 100 pounds of Mercury to 48 of Nitric acid of Sp. Gr. 1·48. From this 112 pounds of the oxide may be made.

The solution in H Cl answers to the tests for Perchloride of Mercury (q. v.)

Tests.—When heated, it gives off Oxygen, and Mercury is left in globules, or is entirely dispersed. (Brick-dust, or the Oxides of Iron or of Lead, will be left.) It does not emit Nitrous vapours when heated; is entirely soluble in H Cl. Water in which it is boiled or washed yields no precip. to solution of Nit. Silver (showing that no Corrosive Sublimate is present).

Action. Uses.—Irritant, Stimulant. As a powder sprinkled over indolent ulcers, or as a Caustic to repress exuberant granulations. A Lotion commonly called *Yellow Wash*, which contains Chlor. Calcium in solution and a precipitate of yellow Hydrated Oxide, is prescribed in similar cases, and should be used only when shaken up. The oxide has been given internally in doses of ⅛ to 1 grain in pills, but is objectionable on account of its uncertain nature.

Lotio Hydrargyri Flava, B. Yellow Mercurial Lotion. *Yellow Wash.*

Prep.—Take of *Perchloride of Mercury*, gr. xviij.; *Solution of Lime*, f℥x. Mix.

Introduced in B. P. 1867. Applied as a wash to syphilitic and chronic ulcers.

Unguentum Hydrargyri Oxidi Rubri, B. Red Precipitate Ointment.

Prep.—B. Take *Red Oxide of Mercury*, in very fine powder, gr. lxij.; *Yellow Wax*, ℥¼; *Oil of Almonds*, ℥¾. Melt the Wax with a gentle heat, mix in the oil, and when nearly cold add the Oxide of Mercury, and mix thoroughly. (¼ strength of D. P.)

This Ointment, when fresh made, is of a bright scarlet colour; but the Oxide by degrees becomes deoxidised, as is evident from the colour changing first to a greyish-red and then to a bluish-grey.

Action. Uses.—Stimulant, applied to indolent sores, and to the eyelids in Chronic Ophthalmia.

HYDRARGYRI IODIDUM VIRIDE, B. Hydrargyri Subiodidum. (Iodidum, L.) Green Iodide of Mercury. Subiodide. *F.* Proto-Iodure de Mercure. *G.* Quecksilberiodür.

The Subiodide of Mercury ($Hg_2 I = 327$) has not been long introduced into medicine, its employment having been first indicated by M. Coindet. It occurs as a heavy greenish-yellow powder, sublimed by heat, insoluble in Water and Alcohol, also in a watery solution of Chlor. Sodium, by which it is easily separated from the Iodide; soluble in Ether and acids. It is decomposed by light; reddened by heat, but becoming yellow on cooling. By a higher degree of heat it is resolved into metallic Mercury and the red Iodide. Comp. Hg. 55·5 + I 44·5 = 100.

Prep.—Rub together *Mercury* ℥j. and *Iodine* gr. cclxxviij., adding gradually *Rect. Spirit* (q. s.) till the globules disappear, and the whole assumes a green colour. Dry the powder in a dark room by exposure to the air. Keep in opaque bottles.

The Mercury and Iodine being mixed in these proportions, and triturated, considerable heat is produced, sometimes to danger of explosion; the Alcohol is added to dissolve the Iodine, which being thus presented in a finely-divided state to the Mercury, the latter becomes rapidly extinguished. It acts also on some Iodide of Mercury which is formed at first, and facilitates its combination with metallic Mercury. The Subiodide of Mercury may also be formed by precipitating or mixing together a solution of Iodide of Potassium with one of Subnitrate of Mercury having a slight excess of Nitric′. (Soub. ii. 515.)

Tests.—A dull green insoluble powder, which darkens on exposure to light. When gradually heated in a test-tube it yields a yellow sublimate ($Hg I$) which on friction becomes red, while a globule of metallic mercury is left at the bottom of the tube. (B.) It is not soluble in Chlor. Sodium. Any impurity will appear if the Subiodide does not answer to all these characteristics. (Both light and heat will generally resolve it into metallic Mercury and the red Iodide.)

Action. Uses.—Irritant poison. Alterative Stimulant in Syphilis occurring in scrofulous patients. Both the Iodides, if continued, will produce the effect of Mercurials.

Dose.—Gr. j.–gr. iij. With eight parts of lard, it forms an ointment for scrofulous sores.

HYDRARGYRI IODIDUM RUBRUM, B. (Biniodidum, E.) Iodide of Mercury. Periodide and Red Iodide of Mercury. Biniodide of some chemists. *F.* Deutoiodure de Mercure. *G.* Doppelt Iodquecksilber.

Iodide of Mercury ($Hg I = 227$) is a powder of a beautiful scarlet colour, insoluble in water. By heat cautiously applied, it is sublimed in scales, which soon become yellow, and, when cold, red. It is partially soluble in boiling rectified Spirit, which affords crystals as it cools. It is dissolved by hot solutions of Iodide of Potassium and Chloride of Mercury, but precipitated from both on cooling. It is totally soluble in a concentrated solution of Chlor. Sodium, 40 parts, at 212°, from which it is again precipitated in fine red crystals on cooling. This serves to distinguish it from the Subiodide of Mercury, which is insoluble in brine. It is remarkable for crystallising in different forms according to the heat at which it has been sublimed, and also for the change of colour from yellow to red, taking place upon merely touching the crystals with a hard body.

Prep.—It may be obtained by the same process as the green Iodide, using half the quantity of Mercury. The B. P. prepares it by precipitation, as in the old formula of the D. C.

B. Dissolve *Perchloride of Mercury* ℥iv. in Oiij., and *Iodide of Potassium*, ℥v. in Oj. of *Dist. water*, and mix the two solutions. When the temperature of the mixture has fallen to that of the atmosphere, decant the supernatant liquor from the precipitate, and, having collected the latter on a filter, wash it twice with cold distilled water, and dry it at a temperature not exceeding 212°.

Some heat is caused by the mixture. The Hg Cl and K I decompose one another, Hg I being precipitated, and K Cl remaining in solution. A crystalline powder of a vermilion colour is produced.

Tests.—It becomes yellow when greatly heated. It is almost insoluble in water, slightly soluble in Alcohol, freely in Ether, or in solutions of K I or Na Cl (boiling). Digested with a solution of Soda, it is decomposed, and becomes reddish-brown. Iodide of Sodium is formed, and the fluid, cleared by filtration, acidulated with Nitric acid, and mixed with solution of Starch, becomes blue. The Iodide should be entirely volatilised by a heat under redness. (B.) Dr Pereira mentions that the presence of Bisulphuret of Mercury may be discovered by fusing it with caustic Potash, and then adding a mineral acid, when Hydrosul′ will be evolved. If heated in a crucible with Carb. Potash, metallic Mercury is sublimed, and K I is left behind, which may be recognised by its tests.

Action. Uses.—Irritant Poison ; Alterative in Scrofulous habits, but seldom employed. *Ext.* Caustic.

Dose.—Gr. $\frac{1}{16}$ to $\frac{1}{8}$ in pill or in Alcoholic solution.

UNGUENTUM HYDRARGYRI IODIDI RUBRI, B. Ointment of Red Iodide of Mercury.

Prep.—*Red Iodide of Mercury*, in fine powder, gr. xvj., with *Simple Ointment*, ℥j. (a quarter as strong as the D. Prep.)

Use.—A stimulant application to Ulcers.

HYDRARGYRI SUBCHLORIDUM, B. (*Chloridum*, L.) (Calomelas, B. 1864.)

Subchloride of Mercury. Calomel. *Chloride*, *Submuriate*, and *Mild Muriate* of Mercury. *F.* Protochlorure de Mercure. Mercure-doux. *G.* Einfach Chlorquecksilber.

The Subchloride of Mercury ($Hg_2\,Cl = 235{\cdot}5$) occurs native in Carniola and in Spain, and is called Horn Mercury and Native Calomel; but it seems also to have been prepared artificially by the Hindoos at very early periods (Fleming and Ainslie), and prescribed by them internally. It has been known in Europe since 1608. [Following Pereira, Brande, and other chemists, and considering the equivalent of Mercury to be 100, the compilers of the British Pharmacopœia (1864) described Calomel as a Subchloride, and Corrosive Sublimate as a Chloride of Mercury. This change of nomenclature was exceedingly inconvenient, and likely to be a source of danger. This is now partly removed by calling the poisonous salt *Perchloride.* (B. 1867.) It must be borne carefully in mind by prescribers and dispensers that what was formerly the *Chloride* is now called *Subchloride* of Mercury, and what was termed *Bichloride* is now to be known as the *Perchloride* of Mercury.]

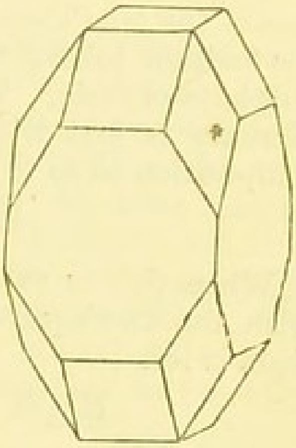

Fig. 30.

Prop.—It is found crystallised in four-sided prisms terminated by four-sided pyramids. When prepared artificially, it may be obtained in similar quadrangular prisms covering a crystalline mass which is fibrous in texture, sparkling, semitransparent, somewhat horny, and elastic. (Brande.) Sp. Gr. 7·2. When scratched, a yellow characteristic streak is observed. As usually seen, it forms a heavy tasteless powder, of different degrees of fineness as well as of whiteness; of a light yellowish or buff colour if obtained by levigation, but when condensed in air, a pure white and impalpable powder is formed. When sublimed into a small vessel it is horny and tough, retaining when powdered a yellow tinge. It becomes of a darker hue when exposed to light, and when heated, yellowish. At a higher degree of heat it sublimes. It is insoluble in pure water, Alcohol, and Ether. Boiled in water for some time, under the influence of alkaline Chlorides, a portion is dissolved. The Alkalies and Lime water instantly render it black, from precipitating the Suboxide and combining with the Chlorine. Chlorine converts it into the Chloride, as does boiling H Cl. Nitric or Sulphuric acids convert half the Mercury into a Chloride, and the other half into Nitrate or Sulphate, NO_4 or SO_2 escaping at the same time. Solution of Protochlor. Tin precipitates metallic Mercury, the Tin taking the Chlorine. Calomel may also be reduced by heating with Carbonate of Soda. Comp. Hg 85 + Cl 15 = 100.

Prep.—B. Moisten *Sulphate of Mercury*, ℥x. with *boiling Dist. water* q. s., and rub it with *Mercury* ℥vij. until globules are no longer visible; add *Chloride of Sodium* dried ℥v., and thoroughly mix the whole by continued trituration. Sublime by a suitable apparatus into a chamber of such size that the Calomel, instead of adhering to its sides as a crystalline crust, shall fall as a fine powder on its floor. Wash this powder with *boiling Distilled water*, until the washings cease to be darkened by a drop of Sulphide of Ammonium.

Finally, dry at a heat not exceeding 212°, and preserve in a jar or bottle impervious to light.

Sulphate of Mercury (see *infra*), which was considered by the L. C. a Bisulphate of the Binoxide, is now regarded as a neutral salt, having the composition ($Hg\,O, S\,O_3$). It is decomposed by heating with the Chloride of Sodium. If this were done at once, the Chlorine of the $Na\,Cl$ would unite with the Mercury to form the Chloride, the Sodium taking the Oxygen and uniting with the $S\,O_3$ to form Sulphate of Soda. To make the Subchloride, another equivalent of Mercury is first triturated with the Sulphate, and enters into its composition so as to form a sulphate of the Suboxide—

$$Hg\,O, S\,O_3 + Hg = Hg_2\,O, S\,O_3.$$

When this is sublimed with Chlor. Sodium, the Chlorine unites with the two equivalents of Mercury to form Calomel, and Sulph. Soda is left—

$$Hg_2\,O, S\,O_3 + Na\,Cl = Hg_2\,Cl + Na\,O, S\,O_3.$$

Along with the Chloride a little Mercury is apt to rise, and some Chlor. Mercury or Corrosive Sublimate to be formed; or some Calomel in subliming may become separated into these two. The next part of the directions, that of washing, is intended to get rid of any Chloride. The B. P. orders boiling water, but it is best done by using cold distilled water, and gradually increasing its heat. The water of many springs, from containing various salts in solution, decomposes the Calomel. The Corrosive Sublimate being readily soluble, its presence will be detected in the water, either by Liq. Potassæ, which will cause a yellowish-red precipitate, or by Ammonia, which causes a white precipitate.

Care must be taken with the latter part of the process, in order to obtain the Calomel of a white colour, and in the state of an impalpable powder. The first improvement was made by Mr Jewell, who kept the vessel into which the Calomel was sublimed full of water or of steam, by which Jewell's patent Calomel and Howard's Hydro-Sublimate or Hydro-Calomel were obtained. The apparatus was improved by Mr Ossian Henry, of Paris, and has been generally adopted, being admitted into the French Codex to produce the "Mercure doux à la vapeur." Many English chemists have long been in the habit of subliming the Calomel into a large chamber full of air. (P. J. ii. pp. 586 and 657.) M. Soubeiran has adopted this method, having first proposed a current of cold air, as had been done by Mr Dann of Stuttgard. In the B. P. the use of a large chamber is ordered.

Calomel may also be obtained in a state of fine division by precipitation, as in the old D. P., though the sublimed kind is preferred. This is called Scheele's Calomel, and by the French, Précipité blanc. It may be prepared by mixing solutions of Protonitrate of Mercury and Chloride of Sodium, and washing well the Calomel which is precipitated. Wöhler and Sartorius obtain a fine crystalline precipitate by passing Sulphurous acid gas into a saturated solution of the Chloride, at a temp. of 122° F.

Dr A. T. Thomson proposed to make both Calomel and Corrosive Sublimate in the most direct manner, by causing the vapours of Chlorine and Mercury to meet together and combine in the proper atomic proportions.

Tests.—Heat sublimes it without any residuum. It is a whitish powder, rendered yellowish by trituration in a mortar. On the addition of Potash it becomes black, and then, when heated, runs into globules of Mercury. The distilled water with which it has been washed gives no precipitate with Nit. Silver, Lime water, or H S. (L.) If any Chloride be dissolved, Nit. Silver will throw down Chlor. Silver, Lime water yellowish Oxide of Mercury, and Hydrosul′ a black Sulphuret of Mercury. Hot Sulphuric Ether agitated with it, filtered, and then evaporated to dryness, leaves no residuum. Any Corrosive Sublimate will be dissolved by the Ether, and give a precipitate of the Oxide of Mercury. The whitest Calomel is not necessarily fine in proportion, as some crystalline specimens are white, and the microscope reveals crystalline grains in other kinds of Calomel. White Precipitate (p. 229) mixed with Sulphate of Baryta has been sold on the Continent as Calomel, and also Sulphate of Baryta mixed with Calomel. (P. J. ii. 728.) That which is condensed in steam, or in a current of cold air, is probably the best, and produces the effects of Calomel with most certainty.

Inc.—Alkalies and their Carbonates, Lime water, Alkaline Chlorides, Sal. Ammoniac, Mineral acids, Metals and their Sulphurets.

Action. Uses.—Alterative, Stimulant, Cathartic, &c., Antiphlogistic, Antisyphilitic. The Sublimed Calomel is usually preferred, though the precipitated, from being finely subdivided, is an effective medicine.

Dose.—Gr. j. Alterative; gr. iij.–gr. v. Cathartic; gr. iij. with a little Opium, 2 or 3 times a-day, will rapidly produce ptyalism; gr. x.–gr. xx. act as a Sedative in particular cases.

PILULA HYDRARGYRI SUBCHLORIDI COMPOSITA, B. Compound Calomel Pill. *Pilulæ Plummeri.* Plummer's Pill.

Prep.—B. Triturate *Subchloride of Mercury* ℥j. and *Sulphurated Antimony* ℥j. together, add *Guaiac. Resin* in powder ℥ij., and *Castor Oil* ℥j. or q. s., and beat into a uniform mass. (1 grain of Calomel is contained in 5 grains of the pills.)

By long keeping these pills become partially decomposed, Sulphuret of Mercury and Chloride of Antimony being formed.

Action. Uses.—Alterative and Diaphoretic in doses of gr. v.; Cathartic in gr. xx. Dr Plummer said of his Pill, that it is in vain to look for its beneficial effects unless the materials are well levigated together, and for a considerable time.

[PILULÆ CALOMELANOS ET OPII, E.

Prep.—Beat into a proper mass *Calomel* 3 parts, *Opium* 1 part, *Conserve of Red Roses*, q. s. Divide into pills, each to contain gr. ij. Calomel.

Action. Uses.—Diaphoretic and Antiphlogistic. A pill taken every three or four hours quickly produces ptyalism.]

UNGUENTUM HYDRARGYRI SUBCHLORIDI, B. Ointment of Subchloride of Mercury. Calomel Ointment.

Prep.—B. *Calomel*, gr. lxxx.; *Prepared Lard*, ℥j.

Calomel is often prescribed in the form of Ointment, and with great benefit in various forms of Cutaneous eruptions. "Pommade de Mercure doux" is made with 1 or 2 parts Calomel to 8 of Lard, to which some oil may be added. Dr Pereira recommends ʒj. to ℥j. of Lard, and Dr A. T. Thomson advises the addition of ʒiv. of Tar Ointment, as one of the best applications in Leprous and other dry and scaly skin diseases.

HYDRARGYRI PERCHLORIDUM, B. (*Hydrargyri Bichloridum*, L.)

Hydrargyri Chloridum. Perchloride or Chloride of Mercury. (*Bichloride of Mercury.*) Corrosive Sublimate. *Oxymuriate, and Corrosive Muriate of Mercury.* *F.* Deuto- and Bi-chlorure de Mercure. Sublimé Corrosif. *G.* Doppelt Chlorquecksilber.

Corrosive Sublimate has been long known to, and prepared by, the Hindoos, being their *ruskapoor* (Hind. Med. p. 45). It seems also to have been known to the Chinese, and it was prepared by Geber in the 8th century. It is largely manufactured for use both in medicine and the arts.

[In prescribing, it must not be forgotten that the Bichloride of Mercury of the L. P. is called Perchloride of Mercury in the B. P.]

Prop.—Perchloride (or Chloride) of Mercury ($HgCl = 135{\cdot}5$) is white, with an acrid metallic and persistent taste, without smell. It is met with in small crystals, or in a heavy semi-transparent crystalline mass. Sp. Gr. about 5·2. It crystallises in right rhombic prisms, sometimes terminated by converging planes. These are readily powdered, and effloresce at the angles when for some time exposed to the air. It is first fused by heat, and then volatilised; is soluble in Water, Alcohol, and Ether; requiring about three times its weight of boiling, and about 16 weights of cold water. Its solubility is much increased by the presence of Chlor. Sodium or Hydrochlor. Ammonia (*see* p. 229). Alcohol dissolves about one-third of its weight, and Ether still more, so as to be employed sometimes in separating it from its aqueous solution and from organic bodies. When exposed to light in contact with organic substances, it is decomposed into Calomel and metallic

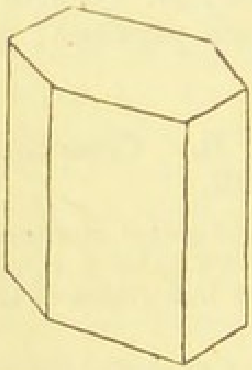
Fig. 31.

Mercury. Nit′ and H Cl dissolve it without change. Potash, Soda, and Lime throw down the yellow Oxide of Mercury, which afterwards becomes brick-red; and Ammonia causes a white precipitate (*see* Hydr. Ammon. Chlorid. p. 229). The alkaline Carbonates precipitate a brick-red Carb. Mercury; Hydrosul′ throws down at first a greyish and then a black precipitate of Sulphuret of Mercury; Ferrocy. Potassium a white Ferrocyanide of Mercury. Iod. Potassium causes a yellow precipitate, which becomes a bright red Iodide of Mercury. Protochloride of Tin, abstracting half of the Chlorine, becomes Perchlor. Tin in solution, while Calomel is precipitated; an excess abstracts more Chlorine, and metallic Mercury in a state of fine division is produced. So that this reagent causes at first a white, and then a black precipitate. Several of the metals, as Copper and Silver, decompose it, combining with the Chlorine and setting free the Mercury. Silver has lately been employed by Dr Frampton. By triturating a grain of the Perchloride with several grs. of metallic Silver, a black powder is produced, and on heating this in the bulb of a small tube, a ring of metallic globules may be obtained. Mercury will combine with the Perchloride, and convert it into the Subchloride: this was one of the old methods for making Calomel. Gold, aided by Galvanic action, readily reduces it to a metallic state, and at the same time forms an amalgam. Thus by dropping the suspected liquor on a piece of polished Gold, as a sovereign, and touching the moistened surface with the point of a penknife, or, as Dr Pereira suggests, applying a key, so that it may touch simultaneously the Gold and the solution, the Chlor. becomes decomposed, and a Silver stain is left on the Gold. A galvanic circuit, which assists the reduction, is produced by the contact of the Gold and Steel. This is a delicate test. (Dr Buckler has suggested the reduction of the Mercury to the metallic state within the stomach by means of Iron-filings and Gold-dust, both being in a state of very fine division.) The solution is known to contain Chlorine by the precipitate with Nit. Silver, insoluble in Nitric acid.

The action of vegetable and animal substances on Corrosive Sublimate is of considerable importance from the combinations which take place in cases of poisoning. Most of the vegetable infusions and decoctions in use as medicines, as well as ordinary articles of diet, decompose it, especially when exposed to the action of light; the Perchloride also is decomposed when triturated with many fatty or volatile Oils; or boiled with sugar; or it may combine with some of the vegetable principles, as in the process of Kyanising wood. The Gluten of wheat acts with more energy, and more like animal principles. The greatest number of experiments have, however, been made with Albumen, into a solution of which, if a sol. of Corrosive Sublimate be dropped, a white flaky precipitate is thrown down, which, when dried, is hard, horny, and brittle. Ammonia rubbed up with this precipitate does not display any blackening, nor does Ac′ leave a white insoluble residuum, both tests showing that no Calomel had been formed. Lassaigne has some time since shown that the precipitate consists of 6·45 Perchloride of Mercury with 93·55 of Albumen, and that it is soluble in an excess of Albumen as well as of sol. of Perchloride of Mercury. It is generally supposed to be an inert and insoluble compound. It is probable that by other organic principles the Perchloride is simply deprived of half its Chlorine, Calomel being precipitated.

Perchlor. Mercury may be prepared by bringing together its constituents, or, as has been done by Dr A. T. Thomson on a large scale, by passing Chlorine through Mercury heated to between 300° and 400°; and by other processes; but it is chiefly prepared by acting on the Sulphate of Mercury with Na Cl.

Prep.—B. Reduce *Sulphate of Mercury* ℥xx., and *Chloride of Sodium* dried ℥xvj. to fine powder, and having mixed them and ℥j. of finely-powdered *Oxide of Manganese* thoroughly by trituration in a mortar, place the mixture in an apparatus adapted for sublimation, and apply sufficient heat to cause vapours of Perchlor. Mercury to rise into the less heated part of the apparatus, which has been arranged for their condensation.

The Sulphate of Mercury and the Chlor. Sodium undergo mutual decomposition. The Cl unites with the Mercury. The Oxygen and SO_3 of the Sulphate are transferred to the Sodium, forming Sulphate of Soda, which remains in the retort.

$$\mathrm{Hg\,O,\ S\,O_3 + Na\,Cl = Hg\,Cl + Na\,O,\ S\,O_3.}$$

The Manganese (MnO_2), by giving off Oxygen, assists in the decomposition of the Na Cl, and prevents the formation of any Subchloride of Mercury.

Tests.—The characteristics of Corrosive Sublimate having been fully given above, its purity may be ascertained by the following tests. It liquefies and sublimes entirely by heat. It is totally soluble in water, and soluble in Rectified Spirit, and in Sulphuric Ether. Fixed impurities will remain after sublimation. Calomel will not be dissolved by water. Five or six parts of Ether will remove the whole of the Perchloride.

Inc.—Alkalies and their Carbonates, Lime water, Soap, Tartar Emetic, Nitr. Silver, the Acetates of Lead, Iodide of Potassium, Sulphuret of Potassium, many metals, infusions of bitter and astringent vegetables, as well as solutions of other vegetable and animal principles.

Action. Uses.—Corrosive, Irritant Poison, in doses of a few grains, produing depression of the nervous system and excessive Mercurialism. In smaller doses, an excellent Alterative in Syphilis, secondary Syphilis, and chronic cutaneous diseases. In the ordinary doses it rarely causes salivation.

Dose.—Gr. $\frac{1}{16}$ to $\frac{1}{8}$, in a pill, or in the following solution. *Ext.* As a lotion, gr. ß–gr. ij. in Aq. Dest. f℥j.

LIQUOR HYDRARGYRI PERCHLORIDI, B. Solution of Perchloride (Chloride) of Mercury.

Prep.—Dissolve *Perchlor. Mercury* and *Chlor. Ammonium* āā gr. x. in *Aq. dest.* Oj. (Restored in 1867 from the L. P.)

The Hydrochlorate of Ammonia is used to increase the solvent power of the water, which used to be effected by common Salt; but the Chloride alone would dissolve in a much smaller proportion of water (*vide supra*), though not so readily.

Dose.—f℥ß–f℥ij. in some bland fluid. One fluid ounce contains ½ gr. of Perchlor. Mercury. As fractional doses of Corrosive Sublimate are administered readily and safely by prescribing this solution, it was considered unfortunate that it was omitted in the B. P. (1864.)

Antidotes.—Albumen, as in the white of Eggs, followed immediately by infusion of Galls or of Catechu; Milk; Gluten of wheat and wheaten flour; Hydrate of Magnesia; Protosulphuret of Iron, if administered immediately, or within 15 minutes after the poison has been swallowed; Iron-filings (with Gold-dust ?); Antiphlogistic treatment, as with other irritant poisons. Opium is useful to allay the symptoms. Of the chemical antidotes Albumen of Eggs is by far the best; the white of one Egg is sufficient to neutralise or render insoluble about 4 grs. of solid Chlor. Mercury.

HYDRARGYRUM AMMONIATUM, B. Hydrargyri Ammonio-Chloridum, L.

Ammoniated Mercury. Amido-Chloride. *Ammonio-Chloride.* White Precipitate. *F.* Chlorure Ammoniaco-Mercuriel insoluble. *G.* Weisser Quecksilber präcipitat.

This salt (Hg_2, Cl, $N H_2 = 251{\cdot}5$) was discovered by Raymond Lully in the 13th century, and is formed by precipitating a solution of Chloride of Mercury with Ammonia. It is met with in masses, or as a heavy white powder, without smell, but having a metallic taste; insoluble in Water, Alcohol, and Ether; decomposed by heat, and resolved into Calomel, Ammonia, and Nitrogen; boiling water resolves it into Hydrochlor. Ammonia and yellow Oxide of Mercury. Sul′, Nit′, and H Cl dissolve and at the same time decompose it. Sol. Caustic Potash, heated with it, expels Ammonia, forms and dissolves Chlor. Potassium, and leaves impure Oxide of Mercury. Although there are differences of opinion as to the nature of this substance, the view of Sir R. Kane appears the simplest and the best, and has been generally adopted by chemists.

Amidogen ($N H_2 = 16$) is a hypothetical radical, capable of combining with metals, like Oxygen, Chlorine, and Cyanogen, forming compounds called Amides. Now it seems that when Ammonia ($N H_3$) is added to a solution of Hg Cl, 1 Eq. of the former is decomposed into $N H_2$, and Hydrogen; then H takes Cl from one equiv. of Chloride, forming H Cl, which unites with a second Eq. of Ammonia. At the same time the $N H_2$ replaces the Cl, and forms with a second equiv. of Hg Cl, a double salt, the Amido-Chloride of Mercury (Hg_2 Cl, $N H_2$), which is the insoluble White precipitate—

$$2\,N H_3 + 2\,Hg\,Cl = Hg_2,\ Cl,\ N H_2 + N H_3,\ H\,Cl.$$

Thus the salt is formed by the substitution by $N H_2$ (Amidogen) of the Cl in Chloride of Mercury, and the union of the Amide of Mercury with some undecomposed Chloride. As stated above, the Amido-Chloride is decomposed by boiling in water, Ox. Mercury and Hydrochlor. Ammonia being produced—

$$Hg_2, Cl, N H_2 + 2 H O = 2 Hg O + N H_3, H Cl.$$

Prep.—B. Dissolve *Perchlor. of Mercury* ℥iij. in *Dist. water*, Oiij., with the aid of a moderate heat; mix the solution with *Solution of Ammonia* ℥iv., constantly stirring; collect the precipitate on a filter, and wash it well with cold *Distilled water* until the liquid which passes through ceases to give a precipitate when dropped into a solution of Nitrate of Silver acidulated by Nitric acid. Lastly, dry the product at a temperature not exceeding 212°,

The changes here occurring have been already explained. The powder is washed to free it from Hydrochlor. Ammonia and Chlor. Mercury.

Tests.—Apt to be mixed with other white powders, as Carbs. Lime and Lead, Calomel, Starch, Sulph. Lime, and Sulph. Baryta. It should be wholly evaporated by heat. It is soluble in H Cl without effervescence (not if any Carb. is present). When digested with Acetic′, Iod. Potassium throws down nothing, either yellow (Iod. Lead) or blue (Iod. Starch). The powder rubbed with Lime water does not become black (showing that no Calomel is present). When heated with solution of Potash, it becomes yellow, and emits Ammonia. No other white substance is known to do so.

Inc.—Acids, Alkalies, acid and metallic Salts, &c.

Action. Uses.—Supposed to be that of other Mercurials, as the Chloride, but it is only used externally.

Unguentum Hydrargyri Ammoniati, B.

Prep.—B. *Ammoniated Mercury*, gr. lxij.; *Simple Ointment*, ℥j.

Action. Uses.—Alterative Stimulant in Cutaneous diseases and indolent ulcers.

Hydrargyri Sulphuretum. (Bisulphuretum, L.)

Red Sulphuret of Mercury. Cinnabar. *F.* Sulfure rouge de Mercure. *G.* Rothes Schwefelquecksilber.

Cinnabar was known to the Greeks. It has been discovered to be one of the pigments employed by the Egyptians. The Chinese as well as the Hindoos have from early times employed it as a medicine, and the former have long been celebrated for their *Vermilion.* It was formerly called *Kinnabari* and also *Minium*, being often confounded with the red Oxide of Lead. It occurs native, both massive and crystallised, and is the principal ore from which the metal is extracted at Idria, Almaden, and in China. It is prepared artificially for use both in medicine and the arts.

Prop.—The Sulphuret of Mercury ($Hg S = 116$), Bisulphuret ($Hg S_2$) of some chemists, when in substance, is of a dark-red colour, heavy, striated, giving a bright red streak when scratched; but when powdered is of a brilliant red, and commonly called *Vermilion.* Sp. Gr. 8·1. It is devoid of both taste and odour, is insoluble in water and Alcohol, and in most of the acids, and unalterable in the air. Heated, it becomes of a brownish-red; in the air, burns with a blue flame, yielding Sulphurous acid gas and metallic Mercury; but it sublimes unchanged out of access of the air. Heated with Potash, globules of Mercury are produced, and the addition of H Cl evolves Hydrosul′. It may be made by the following process:—

Prep.—L. Melt *Sulphur*, ℥v., with *Mercury*, ℔ij. Continue the heat till the mixture begins to swell up. Remove the vessel, cover it closely to prevent the mass taking fire; then pulverise, and sublime.

By the aid of heat, the ingredients combine, and would explode if they were not covered and removed from the fire. A black Sulphuret is formed: by sublimation, it is obtained crystalline, and of a dark-red colour, without any change of composition.

Tests.—Sublimed entirely by heat, without any metallic globules being formed. Heated with Potash, it yields globules of Mercury; is not dissolved either by Nit′ or H Cl, but is soluble in Aqua Regia. Rectified Spirit with which it has been boiled is not reddened (showing absence of Dragon's-blood, &c.) Acetic′ digested upon it yields no yellow precipitate with Iod. Potassium (showing that there is no Red Lead mixed with it). Red Sulphuret of Arsenic will be detected by the tests for Arsenic. (*See* p. 238.)

Action. Uses.—Alterative, but seldom given internally. Still used by the Hindoos in fumigation; but the grey Oxide is preferable for such a purpose.

Dose.—Gr. x.–gr. xxx. For fumigation, about gr. xxx.; but the Sulphurous vapours are irritating when inhaled.

Hydrargyri Sulphuretum cum Sulphure of the old L. P. was a black Protosulphuret with excess of Sulphur; also called *Ethiops Mineral*. It was made by rubbing together equal parts of Mercury and Sulphur until globules were no longer visible. It is an inert preparation, now quite obsolete.

HYDRARGYRI SULPHAS, B.

Sulphate of Mercury. *F.* Deuto-Sulphate de Mercure. *G.* Schwefelsaures Quecksilberoxyd.

The Sulphate of Mercury ($HgO, SO_3 = 148$) is officinal in the B. P. for pharmaceutic purposes. It is a white crystalline salt, which is decomposed on being added to water, with the formation of a soluble acid sulphate, and the precipitation of an insoluble yellow Subsulphate of Mercury.

Prep.—Heat *Mercury*, by weight, ℥xx., in a porcelain vessel, with *Sulph. acid*, ℥xij., stirring constantly until the metal disappears, then continue the heat until a dry white salt remains.

SO_3 is decomposed into Sulphurous acid, which escapes, and Oxygen, which combines with the Mercury. The Ox. Mercury thus formed unites with another Eq. of SO_3 to form the Sulphate, with the above formula. Sulphuric acid does not act on Mercury in the cold.

Action. Uses.—Would no doubt act as other Mercurials, but is officinal for making Hydrargyri Perchloridum and Subchloridum (q. v.)

LIQUOR HYDRARGYRI NITRATIS ACIDUS, B. Acid Solution of Nitrate of Mercury.

Prep. Dissolve *Mercury* ℥iv. in *Nitric′* f℥v., first diluted with *Dist. water*, f℥jß., without the aid of heat. Boil then for fifteen minutes, cool, and keep in stoppered bottles.

When these proportions are adopted, and heat employed, the Hg is oxidised into Hg O, at the expense of a portion of the Nitric′; and this combines with some more Nit. acid, forming a Nitrate of the Oxide of Mercury ($Hg\,O, N\,O_5$). By the addition of much water this salt is decomposed into a soluble Supernitrate and an insoluble Subnitrate. The above liquid contains a large excess of $N\,O_5$, which holds the Nitrate in solution. The Sp. Gr. of the acid liquid should be 2·246.

Action. Uses.—A caustic application, highly esteemed in France.

UNGUENTUM HYDRARGYRI NITRATIS, B. Ointment of Nitrate of Mercury. Ung. Citrinum. Citrine Ointment.

Citrine Ointment, or Ointment of the Nitrate of Mercury, is a much-used and highly valued preparation, which was introduced into the Pharmacopœias as a substitute for one known as Golden Eye Ointment. When properly prepared, it is soft, of a bright yellow or lemon colour, and of a strong Nitrous odour. It is sometimes apt to change, especially if the directions for its preparation are not strictly followed. It becomes then hard, brittle, and almost purverulent, and its colour changes to bluish-grey, greenish, or mottled, the metal becoming by degrees reduced.

Prep.—B. Take of *Mercury*, by weight, ℥iv.; *Nitric acid*, f℥xij.; *prepared Lard*, ℥xv.; *Olive Oil*, f℥xxxij. Dissolve the Mercury in the Nitric acid with the aid of a gentle heat; melt the Lard in the Oil by a steam or water bath, in a porcelain vessel capable of holding six times the quantity; and, while the mixture is hot, add the Solution of Mercury, also hot, mixing them thoroughly. If the mixture do not froth up, increase the heat till this occurs. Keep it stirred until it is cold.

In the L. P. of 1836 the proportion of Mercury to acid was ℥j. to f℥xj. Much difficulty was then experienced in making, and still more in preserving the ointment. Contact with steel, with other ointments, &c., was sufficient to deoxidise and precipitate the Mercury. Mere exposure to the air was frequently enough to effect this change, the ointment becoming dark and pulverulent, as above described. The use of other oils was recommended by some. Others, as Mr Alsop (P. J. I. 100), advised the employment of a heat of about 190°; and it was further found that the use of more Nitric acid tended to prevent the change.

In 1851 the proportion of acid ordered was ℥ij. to ℥j. of Mercury. In the B. P. it is increased by half, and 12 of the acid (Sp. Gr. 1·42) are used. (In B. P. 1864, ℥viij. of 1·5 Sp. Gr., which is the same thing.) The B. P. uses one-third of the quantity of lard, and twice as much oil as was ordered in the L. P. The formula of the B. P., admitted to be a great improvement, resembles that proposed by Dr Duncan.

The salt formed by the action of Nitric acid on Mercury depends on the quantity, and to some extent on the degree of dilution of the acid used. A dilute acid in certain proportions forms a Nitrate of the Suboxide (Hg_2O, NO_5). With a larger proportion of acid the Mercury is peroxidised, and a Subnitrate of the Oxide formed ($2\,HgO, NO_5$). More acid still forms the Pernitrate or neutral Nitrate of the Oxide (HgO, NO_5). Part of the acid is decomposed to yield Oxygen to the Mercury—

$$Hg + 2\,NO_5 = HgO, NO_5 + NO_4.$$

When a smaller quantity of Nit′ is used, NO_2 is formed, instead of NO_4. With the B. proportions, a considerable excess of Nitric acid remains and acts upon the fat afterwards. The solution containing the Mercury is now mixed with the melted lard and oil. Two important changes take place in these fatty matters.

(1.) *Elaidine is formed.* Both lard and oil contain Oleine, a liquid fat, consisting of Oleic acid combined with Glycerine. By the action of Nitrous acid, Oleic acid is converted into Elaidic acid, which is much more solid, but said to be isomeric with it ($C_{36}H_{34}O_4$). This acid, combined with Glycerine, forms Elaidine; but when there is a deficiency of Nitric′, some of it combines with Hg, forming Elaidate of Mercury, while Glycerine is set free. (*See* Boudet, in J. de Chim. Med. viii.)

(2.) *Some portion of the fatty matter undergoes oxidation.* This is the second change. By the action of the Nitric′, which remains in excess, some of the fat is oxidised into a red viscid oil, which is soluble in Alcohol, but the composition of which is ill understood. It is this oil which gives to the ointment, when well prepared, its pure yellow colour. During these changes effervescence takes place; from the escape of Binoxide of Nitrogen, Nitrous acid, and some Nitric′ which remains undecomposed. Soubeiran states that Carb. acid gas is evolved at the same time, but this has been questioned.

The ointment thus prepared should be soft, of a bright yellow colour, and should not become hard or changed in colour by keeping.

Action. Uses.—Stimulant and Alterative application to the eyelids in Chronic Ophthalmia, also in several cutaneous eruptions, and to foul and indolent ulcers. If long applied, it will produce the effects of a Mercurial on the system. When decomposition has taken place, it ought not to be applied, as it then becomes extremely irritant.

[UNGUENTUM HYDRARGYRI NITRATIS MITIUS, L. Milder Ointment of Nitrate of Mercury.

Prep.—Rub together *Ointment of Nit. Mercury* ℥j. and *Lard* ℥vij. It is to be used freshly prepared.

Use.—As an eye-salve in many cases, when the last is likely to irritate].

LINIMENTUM HYDRARGYRI NITRATIS, made with *Ung. Hydr. Nitr.* ℥ijß, *Cerati Simplicis*, ℥vijß, *Olive Oil* f℥v., is used in the Manchester Infirmary.

HYDRARGYRI ACETAS.—The Acetate of Mercury (Hg_2O, Ac') has been long known to chemists, but was introduced into practice in consequence of the French government having, in the middle of the last century, purchased the secret of *Keyser's Pills*, which were vaunted as an anti-syphilitic remedy. Some suppose that he employed a mixture of the Acetates of the Suboxide and of the Oxide of Mercury, and others that he employed the latter only. It is not in the B. P. It occurs in thin scale-like crystals, flexible, white in colour, without odour, but having an acrid metallic taste. Sparingly soluble in cold, and partially decomposed by boiling water, as it is also by boiling Alcohol. Light decomposes and blackens it. Heat resolves it into Acet′ and Carb′ and Mercury. Sul′ disengages the odour of Ac′, and the alkalies precipitate the Black Oxide of Mercury from its solutions, while from that of the Acetate of the Peroxide a yellow precipitate takes place.

The Acetate may be made by mixing hot solutions of Subnitrate of Mercury and Acetate of Potash. Double decomposition takes place, and the Acetate of Mercury, being comparatively insoluble, crystallises out as the solution cools. It is considered a mild Mercurial, but has occasionally acted with violence, in consequence probably of being badly prepared, or having afterwards altered in composition.

Dose.—Gr. j.–gr. v.

HYDRARGYRI CYANIDUM. Cyanide of Mercury.

Cyanide of Mercury (Hg Cy) was discovered by Scheele. It is not now officinal in any of the Pharmacopœias. It is of a dull white colour, without smell, but of a disagreeable metallic taste. Crystallised in anhydrous obliquely truncated four-sided prisms: permanent in the air, partially dissolved by Alcohol, soluble in eight times their weight of temperate, but much less of boiling water. It is dissolved by Nit′, but decomposed by Sul′ and by Hydrosul′, the latter precipitating a black Sulphuret of Mercury from its solution. H Cl disengages from its solution Hydrocyanic′, which is known by its peculiar smell. A glass rod moistened with the sol. of Nit. Silver, and held over it, acquires a deposit (Cyanide of Silver) soluble in boiling Nit′. Heated, it emits Cyanogen, and globules of Mercury are obtained.

The Cyanide may be prepared by saturating the officinal dilute Hydrocyanic Acid with Oxide of Mercury, and evaporating, that crystals may form. It is an irritant poison. Sometimes used as a substitute for Corrosive Sublimate, which it resembles in action.

Dose.—Gr. $\frac{1}{16}$ gradually increased to gr. $\frac{1}{2}$, in pills or in solution.

ARSENICUM.

Arsenic. *F.* Arsenic. *G.* Arsenik.

The name Arsenic is ambiguous even in modern times, being applied sometimes to the metal, and sometimes to one of the compounds which this forms with Oxygen (white Arsenic, or Arsenious acid). The same ambiguity occurs in old works ; for the name Arsenikon (αρσενικον) is applied by Dioscorides to the yellow Sulphuret, while the red Sulphuret is distinguished by the name Sandarach (σανδαραχα). The Arabs calls the former *zurneekh zurd* (yellow), and the second *zurneekh zoorkh* (red). The name *zurneekh* is supposed by Sprengel to be a corruption of Arsenicon, but of this there is no proof. The Arabs were also acquainted with the white Oxide, which they called *sum-al-far*, *mouse-poison*, or Ratsbane, and also *shook*, *turab-al-hulk*, and *turab-al-kai*,'windpipe-earth, and emetic-earth. The Hindoos are well acquainted with all three substances ; Orpiment being their *hurtal*, Realgar their *mansil*, while white Arsenic they call *sanchya*. They were probably the first to prescribe it internally, as in Leprosy (Prof. H. H. Wilson), which they still do, both in that complaint and in intermittent fevers. Metallic Arsenic was first distinctly made known in Europe by Brandt in 1733. Geber seems to have been acquainted with it.

Arsenic (As = 75) is sometimes found native in a metallic state, but it is most extensively diffused in combination with other metals, as in the Arseniurets of Iron, Nickel, Copper, Cobalt, &c. It is separated from these metals by roasting in a reverberatory furnace, and collecting what is sublimed in a long horizontal chimney, or into one divided into numerous compartments. By this process of roasting the metallic Arsenic is separated and oxidised, being converted into Arsenious acid ($As\,O_3$). This, being procured in an impure state, is first purified by sublimation, and then heated with Charcoal, which abstracts the Oxygen, and reduces the Arsenic to its metallic state, and enables it to be separated by sublimation.

Pure metallic Arsenic is prepared by covering Arsenious acid with Charcoal, in a German glass tube, and subliming the metal into the cool or distant end of the same tube.

Prop.—Metallic Arsenic is of a steel-grey colour, has a metallic lustre, is crystalline in texture, and very brittle. Sp. Gr. 5·8. Heated in close vessels, it readily sublimes at a low red heat, and is again deposited in a bright metallic crust, shining like polished steel. Its vapour is remarkable for having a strong smell of garlic. Exposed to the air, it tarnishes, and becomes encrusted with a grey powder, which is an imperfect Oxide, or a mixture of Arsenious acid and metallic Arsenic. It is well known on the Continent as *fly-powder*. It is readily oxidated also in water, and even in Alcohol. Heated in the air, Arsenic easily burns, producing white fumes, which are sometimes called Flowers of Arsenic, but are those of the white Oxide, that is, of Arsenious acid (q. v.)

Arsenic is an acidifiable metal—*i.e.*, it tends to form with Oxygen acids, and not bases. By its combination with Oxygen two distinct acids are formed:—1. Arsenious acid (which is officinal), $As\ O_3$. 2. Arsenic acid, $As\ O_5$, two salts of which are officinal.

Action and Uses of Arsenical Compounds.—(See Liquor Potassæ Arsentis.)

ACIDUM ARSENIOSUM, B.

Arsenious Acid. White Oxide of Arsenic. Arsenicum album. White Arsenic. *F.* Arsenic blanc. *G.* Weisser Arsenic. Arsenichtesaure.

The substance commonly called white Arsenic has been long known (*v. supra*). It is found native, but is almost entirely obtained for use from the refuse ores of different metals in which Arsenic is contained, chiefly in Bohemia and Saxony, but also in Cornwall.

It is prepared in Silesia and in Cornwall by roasting in a muffled furnace Mispickel, or Arsenical Iron Pyrites. As being oxidised, as stated above, $As\ O_3$ sublimes, and Sulphuret of Iron is left behind. The product is purified by a second sublimation in Iron vessels with conical heads. It is then sufficiently pure, and rarely needs a further sublimation.

Arsenious acid ($As\ O_3 = 99$), called also Oxide, and sometimes Teroxide of Arsenic, is colourless, with scarcely any taste, or, after a short time, a very faint sweetish taste,* and devoid of smell both in its solid and vaporous state. It is found in commerce in masses, which, when recently prepared, are transparent and glassy, but in time become opaline and even opaque; often, on breaking a piece which has become so, the interior will be observed still to have a vitreous and transparent appearance, but the fresh surface soon becomes, like the exposed parts, brittle and pulverulent. It may be crystallised in regular octohedrons, on cooling a saturated solution obtained by boiling in water and evaporating, or by careful sublimation. The change in appearance from transparency to enamel-like opacity, is by some ascribed to mere difference of molecular arrangement. The opacity Mr Phillips believes to be owing to the

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* It is often differently described, as "acrid, nauseux," even by Soubeiran. Orfila likewise, as quoted by Dr C., describes it as a rough, not corrosive, slightly styptic taste—persistent and attended with salivation. Dr Christison and his friends, in making experiments on it, "all agreed that it had scarcely any taste at all—perhaps towards the close a very faint sweetish taste." So Dr A. T. Thomson, Dr A. Taylor, Mr R. Phillips. There is little doubt but that in some cases the subsequent effects produced by the irritation of the poison have been confounded with the primary taste.

absorption of water from the atmosphere. These varieties differ from each other in density, the opaque having a less degree of specific gravity than the transparent variety, as ascertained by Messrs Guibourt, Phillips, and Taylor, whose observations are as follows :—

	Transparent.	Opaque.
M. Guibourt, ...	3·7391	3·695
Mr Phillips, ...	3·715	3·620
Dr A. Taylor, . .	3·798	3·529

The solubility in water also of these varieties was said to differ by M. Guibourt, who found the transparent dissolved in 103 parts of water at (15° Cent.) 59° F., and in 9·33 parts of boiling water ; and that the opaque variety dissolved in 80 parts of cold water at the same temperature, and in 7·72 parts of boiling water. Dr Taylor (Guy's Hosp. Reports, vol. iv. p. 83), observing the great discrepancies in the statements of chemists respecting the solubility of Arsenic in water, submitted it to careful experiment ; and he states that there is no observable difference in the solubility of the transparent and opaque varieties of Arsenious acid ; that water at ordinary temperatures dissolves about $\frac{1}{1000}$th or $\frac{1}{500}$th of its weight, according to circumstances ; that hot water at 212°, allowed to cool on it, dissolves less than $\frac{1}{400}$th of its weight, or about $1\frac{1}{4}$ gr. to each f ℥ ; but that water boiled for an hour on Arsenious acid dissolves $\frac{1}{24}$th of its weight, or rather more than 20 gr. to each f ℥ ; and that this water, on perfect cooling, does not retain more than $\frac{1}{40}$th of its weight, or 12 grs. to the f ℥. It is observed as remarkable that the quantity retained in a cold saturated solution prepared by boiling water should be so much greater (that is, 10 to 20 times more) than what cold water can dissolve, or even hot water without the continued boiling. He further confirmed what had been ascertained by Dr Christison, that though the presence of organic matter in a liquid is an obstacle to the solution of the poison, yet that viscid liquids, as gruel, may suspend a larger quantity than they can dissolve. Hence, in searching for Arsenic in organic liquids, or in the stomach or intestines in cases of poisoning, it is proper first to dilute the liquid considerably with water, and, secondly, to boil the liquid thus diluted for 2 or 3 hours. The solution faintly reddens Litmus. Arsenious acid is soluble in Oil, also in Alcohol, which dissolves about 2 grs. (but cold Brandy not above 1 gr.) in the ounce. When subjected to heat, Arsenious acid is volatilised at a temperature of about 380°, but without the characteristic smell of metallic Arsenic, and is again deposited in sparkling octohedral crystals. If heated under the pressure of its own atmosphere, it melts and is transformed into a glassy-looking substance ; but if heated with any Carbonaceous matter, it becomes decomposed, from the Carbon abstracting its Oxygen and setting free the Arsenic, which being itself volatilised, will exhale a garlicky odour. It may be dissolved without change in some acids, but when heated with Nitric the latter is decomposed, and the Arsenious acid, by taking some of its Oxygen, is converted into Arsenic acid. It readily combines with Potash and Soda, forming soluble salts, and also with Lime and some metallic Oxides, forming insoluble and characteristic compounds, which will be noticed among the Tests. Comp. As 75·72 + O 24·21 = 100.

Tests.—Arsenious acid is white, or faintly yellow, and for the most part opaque; but sometimes, when freshly broken, more or less translucent. When pulverised it forms a heavy white powder. Heated in a glass tube, it is sublimed of a white colour; but when cool, it appears in octohedral crystals free from colour. Mixed with Charcoal and exposed to heat, it is reduced to Arsenic, and sublimes, exhaling an alliaceous odour; and when cool, adheres to the tube, having a metallic lustre. It is soluble in boiling water, which deposits it on cooling in octohedral crystals. H S being added to this solution, a yellow substance is thrown down; Ammonio-Nit. of Silver being added, there is a lemon-coloured precipitate; and Ammonio-Sulphate of Copper, a green precipitate. The precipitate with Ammonio-Nit. of Silver is soluble in excess of Ammonia and in Nitric acid. "4 *gr. of Arsenious acid dissolved in boiling water with* 8 *gr. Bicarb. Soda, discharge the colour of* 808 *measures of the volum. sol. Iodine.*" (B.) Arsenite of Soda is first produced, and with Iodine Arseniate of Soda and Hydriodic acid.

As Arsenic and most of its compounds are poisonous, and have been much employed both by suicides and murderers, it is necessary to be able to detect their presence. In suspected cases, any powder adhering to the coats of the stomach, or left in the vessels employed, is to be searched for and kept apart; the stomach and its contents may be boiled in distilled water; or the poison may be searched for in the blood and solids of the body; as it is not found in these or the bones naturally, as was at one time thought by Orfila. We may therefore have to treat it as a solid substance, or in the state of solution, either pure or intermixed with organic matters. We may often get a ready indication of the presence of Arsenic by the process of Reinsch—that is, by boiling a small quantity of the suspected matter with Copper and Muriatic acid, when metallic Arsenic, if present, will be deposited on the Copper, which will appear as if covered with a thin coating of steel.

It will be convenient, in shortly considering the tests for Arsenious acid, to arrange them under nine heads. There are three *dry tests* which may be applied to the acid when obtained in a solid state; and six *liquid tests*, by which it may further be recognised when obtained in solution. The dry tests are as follows:—

1. *Sublimation Test.*—If Arsenious acid be heated alone in a narrow glass tube, it is entirely sublimed, and is deposited inside in a cooler part of the tube in octohedral crystals.

2. *Reduction Test.*—The most satisfactory and convenient test, and one delicate enough for medico-legal purposes, is the reduction of the Arsenious acid to the metallic state, by heating it with Charcoal.

It may be performed, when the quantity is small, with Charcoal in a glass tube, which need not be above the eighth of an inch in diameter. But when the quantity of poison is larger, it is preferable to use a Soda flux.* Heat the Arsenious acid and flux in the flame of a spirit-lamp, applied first to the upper part, and then to the bottom of the tube. A little water escapes, and should be removed with a roll of filtering-paper, and then, holding the tube steadily in the flame, the heat should be raised so as to sublime the metal; it will then be obtained in a brilliant crust, and distinct, even when weighing only the 300th of a grain. When much metal is sublimed, an alliaceous (garlicky) odour will be perceived.

3. *Re-oxidation Test.*—A further proof that the metal is Arsenic is afforded by the greyish-white combined with a crystalline appearance, observable in the cooler parts of the same tube, and which may be further produced, as originally suggested by Dr Turner, by converting the crust, or a portion of it, into Arsenious acid, by chasing it up and down the tube with a small spirit-lamp flame, till it is all converted into a white powder, among which the sparkling triangular facets of the octohedral crystals of Arsenious acid will be seen with the naked eye, or with a glass of four powers. This crystalline powder may be dissolved in a few drops of distilled water; or else, filing off the part containing the sublimate, boil the tube and its contents in another tube, and then apply the following tests.

When a clear solution in distilled water can be obtained, Arsenious acid may be detected by the liquid tests:—

1. *Lime-water Test.*—Lime water, when added to such a solution, gives a white precipitate of Arsenite of Lime; but there must not be any excess of acid, or any free alkali present. This test is, however, so indecisive that it has been abandoned by Toxicologists.

2. *Ammonio-Nitrate of Silver Test.*—Nitrate of Silver, dissolved in 10 parts of water, does not by itself occasion any precipitate; but if a little alkali, such as Ammonia, be first added to the solution of the Nitrate, forming an Ammonio-Nitrate of Silver, a lemon-yellow precipitate (becoming brown in the light) immediately takes place, of the Arsenite of Silver, Nitrate of Ammonia remaining in solution. As the precipitate is soluble in Ammonia, and also in Nitrate of Ammonia, it is necessary to be careful in preparing this test. The Ammonia should be added cautiously, so as nearly, but not quite, to dissolve the oxide first thrown down. If there should be too little Ammonia, the test would precipitate solutions of Phosphoric acid; if too much, the Arsenite of Silver would be redissolved by it.

3. *Ammonio-Sulphate of Copper Test.*—This test is prepared in the same way as the last. Arsenious acid is not precipitated by a

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* Dr C. recommends grinding crystals of Carbonate of Soda with one-eighth of their weight of charcoal, and then heating the mixture gradually to redness. Dr Taylor recommends neutralising a solution of Tar′ with a solution of Carb. Soda, evaporating to dryness, and incinerating in a closed platinum crucible.

solution of Sulphate of Copper unless an alkali be present. For this Ammonia is generally used. By adding just enough Ammonia to redissolve the Oxide of Copper first precipitated, a solution of Ammonio-Sulphate of Copper (q. v.) is obtained. When this is added to an Arsenious solution, a grass-green precipitate of Arsenite of Copper takes place. Dr Taylor has recommended this precipitate to be washed, collected, and dried, and then a small quantity of it, finely powdered, to be introduced into a minute tube, and very gently and carefully heated over the flame of a spirit-lamp, when a ring of small octohedral crystals of Arsenious acid will appear.

4. *Sulphuretted Hydrogen Test.*—When *Sulphuretted Hydrogen* or *Hydrosulphuric acid* is passed through a solution of Arsenious acid, which has been previously acidified with a few drops of H Cl, a bright yellow precipitate takes place of Tersulphuret of Arsenic (Orpiment), which is soluble in Liq. Ammoniæ. The Oxygen of the Arsenious acid and the Hydrogen of the H S unite to form water. Excess of Hydrosulphuric′ (which should have been passed through a double-necked bottle holding water) must be got rid of by heat. Hydrosulphate of Ammonia is sometimes employed, with the addition afterwards of a few drops of acid to neutralise the Ammonia, but is objectionable except as a trial test.

This test is usually preferred to all the others, and is so delicate as to indicate Arsenious′ in 100,000 parts of water; indeed, Dr Fresenius ("Lancet," June and July 1844) would almost rely on it exclusively; and it has the advantage of always acting. The precipitate may be finally heated with black flux or dry Carb. of Soda and Charcoal in a small tube, when the Arsenic will be deposited as a metallic crust, and may be reconverted into octohedral crystals of Arsenious acid, and thus enable the above to be distinguished from other yellow precipitates.

The three last tests, when they are characteristically developed and concur, are considered by Dr Christison to afford unimpeachable evidence of the presence of Arsenic; the more so, as the precipitates may be submitted to the demonstrative proof of reduction.

5. *Reinsch's Test.*—A new process for detecting the presence of Arsenious acid has been discovered by H. Reinsch, and fully reported on by Dr A. Taylor in Brit. and For. Med. Rev. No. xxxi. If Copper foil, cut into pieces about an inch long and $\frac{1}{8}$th of an inch in width, or some fine Copper gauze, be boiled for a short time with a little (about $\frac{1}{10}$th) of pure Hydrochlor. acid in a solution containing Arsenious acid, this becomes decomposed, a thin steel-like coating of metallic Arsenic is deposited on the Copper, and may be separated from it again by dissolving it off with Nitric acid, or by heating in a tube, when it will sublime in the form either of a ring of the metal or as sparkling crystals of Arsenious acid. These may be dissolved in a little distilled water, and the liquid tests applied, if thought necessary. This process has the advantage of being readily applied, and is so delicate as to detect $\frac{1}{200000}$th, or even $\frac{1}{250000}$th part of Arsenic, and so effectual, that Marsh's process fails to show the

smallest trace of Arsenic in the residuary liquid. This proceeding is not to be regarded so much as a *Test*, but as a ready means of separating the Arsenic from a solution, so that other tests may be applied to it when so separated.

6. *Marsh's Test.*—A very delicate process, suggested by Mr Marsh, of Woolwich, has been generally employed since its invention. This depends upon the power of nascent Hydrogen to deoxidise Arsenious acid. The metal Arsenic, combining with the Hydrogen, passes off in the form of Arseniuretted Hydrogen gas, which may be burned so as to obtain the Arsenic in a metallic state, or as Arsenious acid; or may be fixed by being passed into solutions of some of the liquid tests.

The suspected liquor is introduced into a suitable apparatus with pieces of Zinc and some Dil. Sulphuric acid. Water being decomposed, Hydrogen escapes, along with some Arseniuretted Hydrogen gas ($As\,H_3$), if any Arsenic is present. If these two gases are burned at the end of a fine-pointed tube, and a piece of glass or of porcelain introduced into the flame, metallic Arsenic of a blackish colour will be deposited upon it (and may be dissolved off with Nitrohydrochloric); but if the porcelain be held above the flame, then Arsenious acid in a white crust will be deposited; or both deposits may be obtained by holding above the flame the open end of a tube ¼ to ½ inch in diameter and 10 inches in length. (Per.) We may obtain a solution of the acid by holding mica, moistened with a few drops of water, over the flame (Herapath, Med. Gaz. xviii. p. 889); or the gas may be passed into a solution of Nitrate of Silver, as proposed by Dr Clark. The explanation of this test is simple. In the first place, the Arsenious is deoxidised by the action of nascent Hydrogen, produced by the action of Sulph. acid on Zinc. Arseniuretted Hydrogen and water are formed—

$$As\,O_3 + 6\,H = As\,H_3 + 3\,H\,O.$$

$As\,H_3$ is then burnt, and in the centre of the flame, the combustion being there imperfect, H only is oxidised, As remaining free, so that the latter may be obtained on a piece of porcelain—

$$As\,H_3 + 3\,O = As + 3\,H\,O.$$

At the end of the flame the combustion is complete, As being converted into $As\,O_3$. This also may be condensed and tested. When the unburned gas is passed into the solution of Nit. Silver, the Oxide of Silver is deprived of its oxygen, which combines with the As of the $As\,H_3$ to form Arsenious acid, and with the H to form water. Metallic Silver is precipitated as a black powder, and Nitric and Arsenious acids left in solution. The solution may be tested for the latter.

When Arsenious acid is mixed with organic substances, as is usually the case in cases of poisoning, some difficulties are necessarily experienced. These, and the fallacies attending the use of the respective tests, are fully explained and provided for in works expressly devoted to the subject. The processes of Reinsch and of

Marsh, or that with Hydrosulphuric acid, are to be employed with the necessary precautions; and among them it must never be forgotten that some of the substances employed as tests (such as Sulphuric′, Zinc, &c.) are apt to be themselves adulterated with Arsenic. (*See* Christison on Poisons; Dr Taylor on Poisons; Pereira's Materia Medica; M. Struve, quoted in P. J. xiii. 82, &c.)

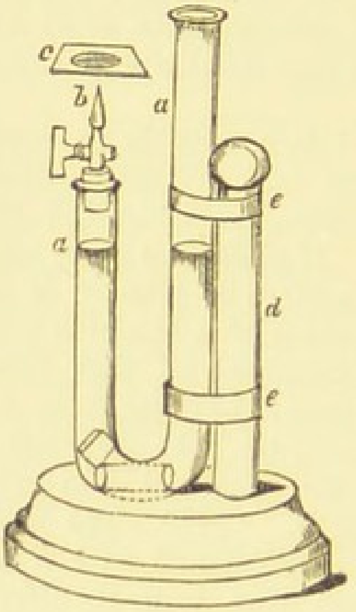

Fig. 32.*

Fig. 33.†

Action. Uses.—A powerful irritant poison, causing vomiting, purging, and various nervous symptoms. 1 to 2 grains may cause death. In medicinal doses, Antiperiodic, Alterative. *Ext.* Occasionally employed as a caustic in Cancers and Cancer-like affections. *See* Liq. Pot. Arsenitis. (*Liquor Arsenicalis.*)

Dose.—Gr. $\frac{1}{16}$ or $\frac{1}{12}$ to $\frac{1}{8}$. Rub up gr. j. with Sugar gr. x., and make into pills with crumb of bread, and divide into 16 pills. The Hindoos usually prescribe it in a solid state with pepper, &c. But it is generally prescribed in the form of Liq. Potassæ Arsenitis.

Antidotes.—Evacuate stomach. Encourage vomiting by mechanical irritation; prescribe an emetic of Sulph. of Zinc, or use the stomach-pump. Give frequent draughts of milk both before and after vomiting has begun (though not in large quantities), or demulcent or farinaceous decoctions. Large quantities of Charcoal have been useful in some cases. A more effectual antidote is the Hydrated

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* Marsh's apparatus. *aa.* Bent tube containing suspected fluid, Sul′, and Zinc. *b.* Stop-cock and jet. *c.* Plate of glass to receive the Arsenic. *d, e.* Supports.

† Reducing tube. *b.* Charcoal and Arsenic. *a.* Metallic stain. The gas may be passed through a long horizontal tube, made of hard glass, and metallic Arsenic reduced by simply applying the flame of a spirit-lamp.

Peroxide of Iron; it must be given in large quantities, and, as ascertained by Dr Maclagan, in the proportion of 12 parts of the Oxide, in a moist state, to 1 of Arsenic; a spoonful of this moist oxide may be given every 5 or 10 minutes, and Reinsch's test employed upon the vomited matters, to ascertain the progress of the case. The Hydrate of Magnesia may be used as an antidote in the same manner. Schroff and others prefer it to the Hyd. Ox. Iron. 8 times the weight of the poison taken must be given. When the poison has been removed from the stomach, arrest inflammation by venesection, promote diuresis, support the strength with Opium, and administer occasional doses of Castor-oil.

[To prevent Arsenic and its compounds from being used in poisoning, the *Act to regulate the Sale of Arsenic* imposes the following restrictions on Druggists and retailers. It is provided—

1. That no Arsenic shall be sold without an entry being made in a book of the purpose for which it is required—with the date, name, and occupation of the purchaser—to be signed by the purchaser and the seller.
2. That either the purchaser must be known to the seller, or the sale must be made in the presence of a witness known to both, who also must sign the entry. That the purchaser must be of full age.
3. That, unless in a quantity of at least ten pounds, no Arsenic shall be sold at all without being first mixed up with Soot or Indigo, in the proportion at least of 1 ounce of Soot or half-an-ounce of Indigo to each pound of Arsenic.
4. From these regulations, which are enforced under a heavy penalty, the prescriptions of medical men are excepted.

The effect of the *Arsenic Act* has been most beneficial, as far as the use of this poison is concerned. Poisoners have lately resorted to the vegetable kingdom, and used Opium, Strychnia, Aconite, &c., to control the free sale of which some new legislative enactment appears to be required.]

LIQUOR ARSENICALIS, B. LIQUOR POTASSÆ ARSENITIS. *Fowler's Solution.* Tasteless Ague Drop.

Prep.—B. Heat *Arsenious acid* in powder, and *Carbonate of Potash*, āā gr. lxxx. in *Aq. dest.* Oß, till they are dissolved. When cold, add *Compound Tincture of Lavender* fʒv., and then add *Aq. dest.* q. s. to fill accurately a pint measure.

When the Arsenious acid and Carbonate of Potash are heated together, the Carbonic acid is expelled, the Arsenious acid combines with the Potash, and an Arsenite of Potash is formed and remains in solution. The Tincture of Lavender is intended only to give a little colour. f℥j. contains gr. iv. of Arsenious acid, and ʒj. contains gr. ½ of the same acid. Sp. Gr. 1·009. The volumetric test for gr. iv. of Arsenious acid (*see* p. 237) may be applied to ℥j. of the solution.

Action. Uses.—This solution of the Arsenite of Potash is the most commonly used of the Arsenical preparations. It must be cautiously given, and as soon as irritation of the bowels is perceived, or œdema of the face, or an eczematous eruption, the medicine must be discontinued for a while. Arsenic is an Antiperiodic and Alterative. It is of great use in Agues, in Intermittent Neuralgia, in Gastrodynia, and in all Periodic disorders. As a remedy in Ague it stands next to Quinia, from which also it differs in two respects. Arsenic cannot be given in a single large dose, as Quinia may ; and Arsenic may be continued during the paroxysm, which is unadvisable with Quinia. The Arsenical medicine is best given after meals, on a full stomach. Arsenic is often of great use in Convulsive disorders, especially Chorea. In Skin diseases its value is still more marked. It has been used in Lepra, but may also be recommended in Vesicular and Pustular eruptions of a Chronic type. When thus prescribed as an Alterative, the Arsenic should be given for some time in small doses. It is ascertained that it passes into the blood by absorption, and it appears to act in this fluid in such a manner as to counteract at least three distinct groups of morbid phenomena.

Dose.—♏iij.–♏v., increased to ♏xx., 2 or 3 times a-day.

ACIDUM ARSENICUM. Arsenic Acid.

Arsenic acid contains the metal in its highest state of oxidation ($As\,O_5 = 115$). It may be made by dissolving white Arsenic in hot $H\,Cl$, and adding $N\,O_5$ as long as red vapours are produced. The Chloride of Arsenic is oxidised by the Nitric acid, $N\,O_4$ and Cl being evolved. On evaporation a white powder is obtained, which is soluble in water, forming a highly acid and intensely poisonous solution. It is tribasic, resembling Phosphoric acid in its chemical relations, and forming salts which are isomorphous with the phosphates. These solutions give a reddish-brown precipitate with sol. Nit. Silver. Two salts of Arsenic acid, the Arseniates of Soda and of Iron, have been introduced in the B. P. In their medicinal effects they resemble other compounds of Arsenic.

SODÆ ARSENIAS, B. Arseniate of Soda.

The Arseniate of Soda ($2\,Na\,O,\ H\,O,\ As\,O_5 + 14\,H\,O$) is similar in chemical constitution to the Phosphate of Soda. It is an active arsenical compound, preferred by some to the Arsenite of Potash for use in skin diseases and other cases where Arsenic is indicated. It has been in use for some time among French and German physicians, but in 1864 was authoritatively introduced for the first time into English practice. The Arseniate of Soda is in colourless transparent prisms, soluble in water. The solution has an alkaline reaction. With $Ba\,Cl$, $Ca\,Cl$, and Sulph. Zinc, it gives white precipitates of the Arseniates of those metals ; with Nit. Silver, a brick-red precipitate of the Arseniate of Silver. All of these precipitates are soluble in Nit. acid.

Prep.—B. Take of *Arsenious acid*, ℥x.; *Nitrate of Soda*, ℥viiiſs; *Dried Carbonate of Soda*, ℥vſs; *Boiling Distilled water*, f℥xxxv. Reduce the dry ingredients separately to fine powder, and mix them thoroughly in a porcelain mortar. Put the mixture into a large clay crucible, and cover it with the lid. Expose to a full red heat till all effervescence has ceased, and complete fusion has taken place. Pour out the fused salt on a clean flagstone, and as soon as it has solidified, and while it is still warm, put it into the boiling water, stirring diligently. When the salt has dissolved, filter the solution through paper, and set it aside to crystallise.

Drain the crystals, and, having dried them rapidly on filtering paper, enclose them in stoppered bottles.

In the formula of Cottereau, of which this is an imitation, 100 parts of white Arsenic were mixed with 116 of Nit. Soda, and heated in a reverberatory furnace. The salt thus produced was dissolved in water, and neutralised with Carb. Soda. The Nit. acid of the Nit. Soda is decomposed, yielding part of its oxygen to the $As\,O_3$, which becomes $As\,O_5$. This combines with the Soda of the Nitrate, but one-half of the $As\,O_5$ remains uncombined—

$$2\,As\,O_3 + 2\,(Na\,O,\,N\,O_5,\,H\,O) = (2\,Na\,O,\,H\,O,\,As\,O_5) + As\,O_5 + 2\,N\,O_3 + H\,O.$$

The Carbonate of Soda, acted on by the uncombined $As\,O_5$ forms another equivalent of Arseniate of Soda.

Tests.—It is soluble in about 2 parts of water. Heated to 300° it loses its water, 40·38 per cent. of its weight. "*A solution of* 10 *gr. of the residue, with* 53 *measures of volumetric sol. Soda, gives a precipitate with volumetric sol. Nit. Silver until* 1613 *measures have been added.*" (B.)

Action. Uses.—Resembles the Arsenite of Potash, but is considered by some to be milder and less irritant.

Dose.—Gr. $\frac{1}{16}$ to gr. $\frac{1}{8}$. It is best given in the form of the following solution.

LIQUOR SODÆ ARSENIATIS, B. Solution of Arseniate of Soda.

Prep.—B. Dissolve *Arseniate of Soda* (rendered anhydrous by a heat not exceeding 300°) gr. iv. in *Dist. water* ℥j.

It contains gr. iv. in the ounce, like the solution of Arsenite of Potash. It is not coloured by any tincture of Lavender. May be used in the same doses as the old Arsenical solution, and in the same cases. Some state that it produces less irritation of the gastric and conjunctival mucous membranes.

Dose.—♏iij.–♏vj., increased to ♏xx.

FERRI ARSENIAS, B. Arseniate of Iron.

The Arseniate of Iron ($3\,Fe\,O,\,As\,O_5$) may be made by precipitating a solution of Sulphate of Iron with one of Arseniate of Potash or Soda. It is an insoluble green tasteless powder. The Iron becomes partially peroxidised in drying, as stated by the B. P. It is soluble in $H\,Cl$, and the solution gives blue precipitates with both the Ferridcyanide and Ferrocyanide of Potassium. Boiled with caustic Soda, the Arseniate of Soda is produced. The solution, neutralised with $N\,O_5$, gives a brick-red precipitate with solution of Nit. Silver. This substance having been long in use among continental physicians, and favourably reported on by a commission of the French Academy, was in 1864 for the first time introduced into an English Pharmacopœia.

Prep.—B. Dissolve *Arseniate of Soda*, dried at 300°, ℥iv., and *Acetate of Soda*, ℥iij., in two pints, and *Sulphate of Iron*, ℥ix. in three pints of *boiling Dist. water*, mix the two solutions, collect the white precipitate which forms on a calico filter, and wash until the washings cease to be affected by a dilute solution of Chloride of Barium. Squeeze the washed precipitate between folds of strong linen in a screw press, and dry it on porous bricks in a warm air chamber whose temperature shall not exceed 100°.

Three equiv. of Sulph. Iron are decomposed. The $As\,O_5$ unites with $3\,Fe\,O$ to form the Arseniate. The $3\,S\,O_3$ unite with 2 equiv. of Soda in the Arseniate and one in the Acetate, to form 3 equiv. of Sulph. Soda, which remain in solution, with Acetic acid.

Tests.—The solution in $H\,Cl$, when diluted, does not precipitate $Ba\,Cl$ (no $S\,O_3$ left). "20 *gr. dissolved in* $H\,Cl$, *diluted with water, give a blue precip. with Ferridcyanide of Potassium, till* 170 *measures of volumetric sol. Bichrom. Potash have been added.*" (B.) The iron in the salt is apt to become peroxidised, especially if it is not quickly dried. The B. P. intends that there should be at least so much of the Protoxide as to require this quantity of the Bichromate to peroxidise it.

Action. Uses.—Applied externally, it is a caustic; given internally, it is dissolved in the stomach, and acts like other compounds of Arsenic. Mr Carmichael used it as an application to cancerous tumours and sores. It forms a slough, which separates in a few days. It may be diluted with 4 parts of Phosphate of Iron, 30 grs. of the Arseniate being used with 120 grs. of the Phosphate.

Cazenave and Biett have given it internally in herpetic and squamous eruptions. M. Dupare states that it does not produce the same unpleasant symptoms as the alkaline salts of Arsenic.

Dose.—Gr. $\frac{1}{16}$ to gr. $\frac{1}{8}$ in pill. For external use gr. xxx. may be made into an ointment with ℥j. of lard. Its use externally is dangerous, and requires the greatest caution.

LIQUOR ARSENICI HYDROCHLORICUS, B. Hydrochloric Solution of Arsenic. Liquor Arsenici Chloridi, L. Solution of Chloride of Arsenic. De Valangin's *Solutio Solventis Mineralis.*

This solution is the authorised form of a preparation that has been for some time in use, and was introduced by Dr De Valangin towards the close of the last century. The inventor prepared what he called "Solvent Mineral," by subliming Arsenious acid with Common Salt; the product was then dissolved in dilute Hydrochloric acid. But by the sublimation with salt no chemical change is effected, pure Arsenious acid being sublimed. This part of the process has therefore been discarded. The preparation of the L. P. has been restored in B. P. 1867.

Prep.—Boil *Arsenious acid* gr. lxxx. in powder, with *Hydrochloric acid* ʒij., and ℥iv. *Dist. water* until dissolved. Add *Dist. water* to make up Oj. Nearly

3 times as strong as L. P., and same strength as Liquor Arsenicalis. Sp. Gr. 1·009.

In one ounce of this solution 4 grains of Arsenious acid are dissolved. But it is most probable that the solution contains a Terchloride of Arsenic. Thus, when 3 Eq. of H Cl act upon 1 of Arsenious acid (As O_3), the Oxygen and Hydrogen unite to form 3 Eq. of water, and 3 Cl form with the Arsenic a soluble Terchloride—

$$As\ O_3 + 3\ H\ Cl = As\ Cl_3 + 3\ H\ O.$$

When the solution is evaporated, it seems to be again decomposed, and Arsenious acid separates in small crystals. Thus Mr Phillips considers that when dissolved first in the Hydrochloric acid it remains undecomposed.

Arsenic may be detected in this solution by the tests already enumerated. With a solution of Nitrate of Silver it produces a precipitate of Chloride, insoluble in Nitric acid, but soluble in Ammonia.

The solution of Chloride of Arsenic is now of the same strength as Fowler's solution, and is by many preferred to the latter.

Action. Uses.—It is a good form for the exhibition of Arsenic generally. Action similar to the Arsenite of Potash, but supposed by some to be less irritating to the stomach. It is highly recommended by Drs Bateman and Farre in the treatment of cutaneous diseases.

Dose.—♏ij.–♏v., gradually increased.

RED SULPHURET OF ARSENIC was in ancient times employed in medicine, as it still is in India, together with the Yellow Sulphuret. The Red is commonly known by the name of Realgar, and is a natural production, but is also prepared artificially. It is a Bisulphuret (As $S_2 = 107$), and is usually met with in red vitreous masses, or as a red powder, being employed as a pigment. It acts as a poison, a part being converted into Arsenious acid in the stomach, though, after death, both the Bisulphuret and the acid are liable to be converted into the Tersulphuret, by means of the H S gas given off during the putrefactive process.

YELLOW SULPHURET or ORPIMENT (Auripigmentum), Tersulphuret of Arsenic (As $S_3 = 123$), is a natural production, and may be produced artificially by passing H S through solutions containing Arsenious acid. The Orpiment of the shops is a mixture of Sulphuret and of Arsenious acid, and is hence more rapidly poisonous than natural Orpiment. King's Yellow is another impure Sulphuret, of which the finest kinds are said to be imported from the East. Dr Christison states that, according to his experiments, it contains a large proportion of Sulphuret of Arsenic, some Lime, and about 16 per cent. of Sulphur.

TERIODIDE OF ARSENIC.—Arsenici Teriodidum (As I_3) is an orange-red powder, without taste or smell, easily volatilised. It may be obtained by heating 1 part of metallic Arsenic with 5 parts of Iodine. It has been administered with benefit in doses of gr. $\frac{1}{8}$, gradually increased to gr. $\frac{1}{4}$, in some chronic cutaneous diseases, as Lepra and Psoriasis. It is contained in the next preparation.

[LIQUOR ARSENICI ET HYDRARGYRI HYDRIODATIS, D. Solution of Hydriodate (Iodide) of Arsenic and Mercury. Donovan's Solution. Sol. of Iodo-Arseniate of Mercury (Soubeiran).

This preparation was introduced into medical practice by Mr Donovan of Dublin, who, in 1839, published a form for preparing it very similar to that afterwards adopted by the D. C.

Prep.—D. Rub together *Arsenic*, in fine powder, gr. vj.; *pure Mercury*, gr. xvj.; *pure Iodine*, gr. lß; *Alcohol*, fʒß, until a dry mass is obtained; and having triturated f℥viij. of *Water* with this in successive portions, let the whole be transferred to a flask, and heated until it begins to boil. When cool add *Dist. water* (q. s.) to fill up to f℥viij. and fʒvj.

The Alcohol aids the combination of three substances. The Iodine used is about sufficient to convert the Arsenic into a Teriodide ($As\ I_3 = 456$), and the Mercury into Iodide ($Hg\ I = 227$). These would be formed very nearly in the equivalent proportion of one of the former to two of the latter, to do which exactly would need 75 grains of metallic Arsenic, 200 of Mercury, and 635 of Iodine. The liquid may then be considered as a solution of Teriodide of Arsenic and Iodide of Mercury combined together. The proportions of the 3 elements in 1 fluid ounce are equivalent to 1 gr. of Arsenious acid, 2 grs. of Oxide of Mercury, and 6 grs. of Iodine.

The colour of the solution is a greenish-yellow; it has a styptic taste; it precipitates solutions containing Opium or Morphia. Mercury (Oxide), Iodine, and Arsenic, may be recognised in it by their respective tests.

Soubeiran has proposed to form the two Iodides separately, and then to dissolve them, in such proportion that the solution shall contain $\frac{1}{100}$th part of each of the Iodides. It is a little stronger than Donovan's solution.

Action. Uses.—It combines the effects of Arsenic and Mercury with those of Iodine. It has been used successfully in Syphilis, as well as in Lepra and other skin diseases.

Dose.—♏x.–ʒß; to be given cautiously, like the other preparations of Arsenic.]

CERIUM. Cerium.

This metal (Ce = 46) was discovered in 1803 by Berzelius in a Swedish mineral called *Cerite* or *Heavy-stone*. It may be made by treating this stone with H Cl, separating the iron from the solution with Benzoate of Ammonia, and precipitating the Oxide of Cerium with Ammonia in excess. This oxide is again dissolved in H Cl, and the dried Chloride treated with Potassium. Chloride Potassium is removed by means of water, and Cerium remains as a grey metallic powder, which, when heated, burns into an oxide. It is very difficult to separate Cerium from two other rare metals, Lantanum and Didymium, which are associated with it. The oxide of Didymium gives a yellow or brownish colour to the Protoxide and Sesquioxide of Cerium, both of which should be white.

The soluble salts of Cerium have a sweet and astringent taste. With the Alkalies and their Carbonates they give yellowish-white precips. insol. in excess. With Phosphate of Soda a precip. which is sol. in Nit. acid. With Oxalic Acid or Oxalate Ammonia, a precip. sol. in Nit. acid. With a strong solution of Sulphate of Potash or Soda, a precip. of a double sulphate of Potash (or Soda) and Cerium. (This test is characteristic.) No precip. with H S or infusion of Galls. White precip. with yellow Prussiate of Potash.

CERII OXALAS, B. Oxalate of Cerium.

This ($Ce\,O, C_2\,O_3$) is an insoluble salt made by mixing a solution of any soluble salt of Cerium (as the Chloride) with sol. of Oxalate Ammonia. It is a white granular powder, insol. in water, decomposed by a red heat into a reddish-brown powder (impure Oxide) which is sol. without effervescence in H Cl, giving a solution which answers to the tests for Cerium given above. The B. P. adds—"If the salt be boiled with solution of Potash and filtered, the filtrate is not affected by solution of Chloride Ammonium (which would precipitate any Lead or Silver); but when supersaturated with Acetic acid it gives with Chloride Calcium a white precip. (Oxalate of Lime), sol. in H Cl." 10 gr. lose 5 to 2 gr. in weight when incinerated.

Action. Uses.—Resembles Silver in its action. Introduced into practice by Sir James Simpson as a remedy for vomiting produced by pregnancy, hysteria, or other causes.

Dose.—Gr. j.–gr. ij. It may conveniently be made into pills with extract of Gentian.

ARGENTUM (PURIFICATUM), B.

Silver (Refined). *F.* Argent. *G.* Silber.

Silver, one of the most anciently known of the metals, is found native, or combined with Sulphur, in considerable quantities; also as a Chloride, and alloyed with other metals, especially Lead, Gold, Antimony, Arsenic, Copper. It is widely diffused in nature, and has been lately discovered in minute quantities in sea-water. It is separated from its ores by the process of amalgamation, or from Argentiferous galena, by roasting to expel the Sulphur, and submitting the lead (which contains Silver) to the process of cupellation. The Arabs are thought to have been the first to employ it in medicine. In its metallic state it is inert, but being little liable to alteration, or to be affected by reagents, it is much employed for surgical instruments and for vessels for chemical purposes.

Prop.—Silver ($Ag=108$) is remarkable for its whiteness and brilliancy, as well as for its malleability. Sp. Gr. 10·47. Unalterable in the air, with the exception of a little tarnishing from the formation of Sulphuret of Silver. It melts at a bright red heat (1873° Daniell, 1830° Prinsep), but does not oxidise at any temperature, unless heated with some fusible siliceous substance, or acted on by Nit'. The Oxide of Silver is reducible by heat. Boiling Sul' converts Silver into a Sulphate, while H Cl has little action, though it combines with Chlorine, as also with Cyanogen and Sulphur. The standard Silver of this country contains 18 parts of Copper to 222 of Silver.

Tests.—Silver is sometimes mixed with Gold, usually with Copper, often with Lead. It is entirely dissolved by Dil. Nit' (any Gold will remain undissolved as a dark-coloured powder). "Ammonia being added in excess, the resulting fluid (Ammonio-nitrate) exhibits neither colour nor turbidity." (B.) The solution in $N O_5$, on the addition of an excess of Chloride of Sodium, gives a white precipitate (Chloride of Silver), which an excess of Ammonia dissolves (any Lead will be dissolved by the Nit', and precipitated by the Chloride, but remain undissolved by the Ammonia). The Chloride of Silver being removed, and Hydrosulphuric acid added to the solution, it is not coloured by it, and nothing is thrown down (showing that both Lead and Copper are absent). Chloride of Lead is slightly soluble in cold, and still more in hot water. Iron, Copper, and Mercury reduce the solutions of Silver to a metallic state.

Pharm. Uses.—Employed for making Nitrate of Silver.

Very thin sheets of Silver, constituting *Silver-leaf*, are used to detect the presence of Nitric in Acetic acid. A strip being digested in pure Acetic', and H Cl afterwards dropped in, nothing should be thrown down. Pure Silver is soluble in Nitric, but not in Acetic acid.

ARGENTI OXIDUM, B.

Oxide of Silver.

Oxide of Silver ($Ag O = 116$) may be obtained by adding caustic Potash to a solution of Nitrate of Silver. ʒij. of the former to ʒiv. of the latter substance will yield about ʒiij. of the Oxide of Silver. The Oxide is thrown down of a brown colour, is soluble in Ammonia, and to a small extent in water, which then has an alkaline reaction. Some of that sold is a Carbonate of Silver, made with Carb. Potash instead of the Caustic Alkali. The Oxide should dissolve completely in $N O_5$, without the evolution of gas, forming a solution which has the characters of Nitrate of Silver. "29 gr. heated to redness leave 27 gr. of metallic Silver." (B.)

M. Sementini (Journ. de Pharm. viii. 93) inferred that it was to this Oxide that the antispasmodic properties of Nitrate of Silver were due. Mr Lane (Med. Chir. Rev. 1840) has also argued that the Nitrate becoming Chloride of Silver in the stomach, and that being carried by the circulation to the cutaneous surface, is there converted into Oxide by the action of light and the strong affinity of Albumen ; but that if the Oxide be prescribed, as it cannot penetrate the capillaries, its passage to the skin would not take place, and therefore the disfigurement or blue colour of the skin would be avoided, and the sedative effects of the Nitrate of Silver obtained without its causticity. Some exceptions, however, must be made to the latter part of this statement. It seems that the Oxide of Silver forms a soluble compound in the stomach, and is thus absorbed into the blood; and further, cases have been recorded in which discoloration has resulted from its use.

Prep.—B. Dissolve *Nit. Silver* in crystals ℥ß in *Dist. water* f℥iv.; pour the solution into a bottle containing *Lime water* Oiijß, shake well, and set by until the sediment subsides. Separate by filtration; wash with *Distilled water* ℥vj., and dry it at a heat not exceeding 212°. Preserve in a stoppered bottle.

It has been prescribed in doses of gr. ß to gr. j., 2 or 3 times a-day in a pill with crumb of bread, gum, or with sugar. Dr Stenhouse has shown that some of these reduce the Silver if aided by heat.

Action. Uses.—An effective substitute for the Nitrate of Silver.

CHLORIDE OF SILVER ($AgCl = 143{\cdot}5$) is always produced when Nitrate of Silver is added to a solution of a Chloride, for which, therefore, the former is always used as a test. It forms a curdy precipitate, at first white, afterwards becoming of a blackish colour under the influence of light and moisture. It is insoluble in water, and also in Nit′, but is soluble in Ammonia. Dr Perry, of Philadelphia, considering that the Nitrate must in the stomach be converted into Chloride of Silver, inferred that this might be prescribed as an efficacious medicine to produce the alterative and tonic effects of Silver. This depends on the assumption (as also does the theory mentioned above) that Hydrochloric′ is the acid of the gastric juice. He prescribed it in doses of gr. ½ to gr. iij. and gr. xij. 3 times a-day, and states that, in less doses than 30 grains, no irritating effects result, but if that quantity be given at once it will produce emesis. (Brit. and For. Med. Rev. xii. 567.)

ARGENTI NITRAS, B.

Nitrate of Silver. Lunar Caustic. *Lapis Infernalis. F.* Nitrate d'Argent. *G.* Silbersalpeter.

Nitrate of Silver ($AgO, NO_5 = 170$) was known to Geber, and has long been employed in medicine. Its two forms, *crystallised* and *fused*, were formerly supposed to possess different properties; but they differ only in molecular arrangement. In a crystallised state, Nitrate of Silver is white and transparent, in the form of hexangular tables or right rhombic prisms, of a powerfully metallic taste, and so bitter as formerly to have been called *Fel metallorum*, also *Centaurea Mineralis.* Heavy, without water of crystallisation, permanent in the air, soluble in its own weight of water at 60° F., and in half its weight of boiling water; readily so in hot Alcohol, but the greater portion is again deposited on cooling. Subjected to heat, it melts at 426° (at a higher heat it is decomposed), and is then run into moulds. "A fragment heated on charcoal with the blowpipe first melts, then deflagrates, leaving behind a dull white metallic coating." (B.) Usually seen in sticks of a dark-grey colour; when fresh made, greyish coloured, striated, and radiated in structure. The change in colour is probably owing to its becoming reduced at the surface, dependent on organic matter in the air; strong light has been thought to reduce it, but Mr Scanlan proved that if confined in a clean glass tube, hermetically sealed, and exposed to the light of the sun, it undergoes no change. It stains the skin of a blackish colour, as it does all organic matter, whether in solution or substance, and acts as a caustic on the latter. Its presence is readily distinguished by the white curdy precipitate which takes place on the addition of a Chloride or H Cl to its solution. The Chloride of Silver deposited becomes black on exposure to light, is dissolved by Ammonia, but not by Nit′. It is frequently employed in the P. as a test for Chlorides, and when ammoniated is one of the tests for Arsenious acid. Ferrocyanide of Potassium gives a white, and Hydrosulphuric′ a black precipitate. Alkalies or Lime water give a dark-brown precipitate of Oxide, soluble in excess of Ammonia. In a solution of Phosphate of Soda, or of an alkaline Arsenite, Nit. Silver gives a yellow precip. The Phosphate of Silver is soluble in a small quantity of Ammonia, the Arsenite in a larger proportion. Comp. Ag O 68·24 N′ 31·76 = 100.

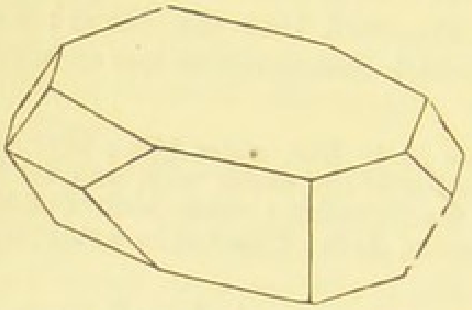
Fig. 34.

Prep.—B. Add *Nitric acid* ℥iiß and *Dist. water* ℥v. to *Refined Silver* ℥iij. in a flask, and apply a gentle heat till the metal is dissolved. Decant the clear liquor from any black powder which may be present, into a porcelain dish, evaporate, and set aside to crystallise; pour off the liquor, and again evaporate and crystallise. Let the crystals drain in a glass funnel, and dry them by exposure to the air, carefully avoiding the contact of all organic substances. To obtain the nitrate in rods, fuse the crystals in a capsule of platinum or thin porcelain, and pour the melted salt into proper moulds. Nitrate of Silver must be preserved in bottles carefully stoppered.

The Nitric′ heated in contact with Silver becomes decomposed, and a portion of its Oxygen combines with the Silver; the Oxide of Silver which is thus formed unites with the Nit′ remaining undecomposed, and thus Nitrate of Silver is obtained. The Nitrogen of the decomposed Nit′ escapes in union with 2 Eqs. of Oxygen in the form of Nitric Oxide, which, uniting with a portion of the Oxygen of the atmosphere, fumes of Nitrous acid gas are observed—

$$3\,Ag + 4\,N\,O_5 = 3\,Ag\,O,\,N\,O_5 + N\,O_2.$$

By driving off the whole of the water, and continuing the heat, it is fused, and then run into moulds.

Tests.—Apt to contain some reduced Silver, Nitrates of Copper, of Lead, of Zinc, and of Potash. It should be white; soluble in distilled water, with the exception of a very scanty black powder (Silver); Copper immersed in this solution precipitates the Silver. "Gr. 10 in ℥ii. dist. water give with H Cl a precip. which, when washed and dried, weighs 8·44 grs." (B.) This is a quantitative test of purity. It should be kept excluded from light and air. Other characters as detailed under SILVER. If copper be present, the Nit′ would produce a greenish or blackish Nitrate of Silver, and Ammonia will change the solution to a bluish colour. Chloride of Sodium will precipitate the whole of the Silver in the state of Chloride, which will be dissolved by Ammonia.

The Chloride of Silver being removed, and Hydrosulphuric′ added to the solution, it is not coloured by it. If Zinc should be present, a white Sulphuret of Zinc will be precipitated; and if Copper, then a black Sulphuret of this metal. The solution, being evaporated, should leave no residue; any saline impurity will be left, and may be tested.

Inc.—Sul′, Phosph′, H Cl, Tar′, H S, and the salts which contain these; Alkalies and their Carbonates; Lime water. Ammonia in excess redissolves the precipitate first formed. Spring and River water when containing any of the above. Astringent infusions, and other organic substances, as Albumen, Milk, &c.

Action. Uses.—Nitrate of Silver in the solid state is Caustic, blackening the surface to which it is applied. It is thus used to destroy morbid growths, and applied to ulcers and poisoned bites. It is used in solution to form astringent lotions, and collyria in Ophthalmia. It excites a healthy action in inflamed mucous surfaces. Internally, in small doses, it is given as an Anticonvulsive, more especially in Epilepsy. To do good it must be continued for some time, and is then apt to produce an unpleasant blackish or bronzed appearance of the skin, which cannot be removed. It is sometimes given in Pyrosis and Gastrodynia, probably acting directly on the mucous membrane of the stomach. The Oxide of Silver resembles the Nitrate in its action on the system after absorption, and may thus be used in Spasmodic disorders. The Nitrate must not be prescribed with Chlorides or with Tannic acid, which would decompose it. This, indeed, all organic substances are liable to do. It is best given alone, or with some free Nitric acid. It is used as a *test* by the B. P.; for Chlorides, as in *Liquor Ammoniæ*, *Nitrate of Potash;* to recognise *Phosphoric* and *Arsenious* acids; as a positive test for *Iodide of Potassium*, and a quantitative test for sol. of *Hydrocyanic acid.*

Dose.—Gr. ¼–gr. ij. or more, made into pills. Readily decomposed in the stomach by H Cl, Chlorides, &c. Should not be made into pills with Tannic acid, or both will be decomposed, the results being metallic Silver, Gallic acid, and Carbonic acid, the last causing the pills to swell up. *Ext.* As a Lotion of various strengths.

Antidotes.—Chlorides, Milk, Albumen. Evacuate stomach. Antiphlogistic treatment.

A solution of the *Ammonio-Nitrate of Silver*, used as a test by the B. P., is made with Nit. Silver in crystals ¼ oz., Solution of Ammonia ½ oz. or q. s., and Dist. water to make up 10 oz.

AURUM. (B. Appendix.)

Gold. *Sol. Rex Metallorum. F.* Or. *G.* Gold.

Gold (Au=196·5) being always found native, was one of the earliest known metals, and is highly esteemed for its many valuable properties. By some the Greeks, by others the Arabs, are supposed to have been the first to employ it medicinally. The alchymists diligently investigated its properties for the purpose of finding the elixir of life and the universal remedy; but the Hindoos seem to have preceded them in this course.

Prop.—Gold is the most ductile and malleable of all metals. Its fusing point is above that of Silver. At a very intense heat it is slightly volatile, and burns with a green flame. Its Sp. Gr. is 19·5. Its oxide is reducible by heat. Gold is unchanged in the air, and soluble in no acid but Nitro-hydrochloric (q. v.), which owes this property to the presence of Chlorine in a free state. Oxygen unites with it in several proportions. It is characterised by a purple precipitate being produced when Protochloride of Tin is added to a solution of Chloride of Gold, and by Protosulphate of Iron causing a brown precipitate, which, with the aid of the blowpipe, may be fused into a globule of Gold.

Uses.—The B. P. uses it only to make the Terchloride, which is employed as a test for Atropia and other alkaloids. It was employed by the L. C. in the state of gold-leaf, as a test for free Chlorine in Hydrochloric acid. Pure H Cl will not dissolve gold-leaf, but does so when free Cl is present. (Both Hydrochloric and Nitric acids are liable to contain free Chlorine, on account of the frequent presence of Chloride of Sodium. So that in the preparation of either of these, some of the other acid is produced, and they react on each other, producing Chlorine and an Oxide of Nitrogen.)

PULVIS AURI.—Gold-leaf, rubbed up with Honey, or, as in the Fr. Codex, with Sulphate of Potash, and then washed with water, is left in the state of a fine powder of a brown colour. It was submitted to experiment by M. Chretien and by M. Lallemand, and found to be mild in action but certain, of considerable benefit as an antisyphilitic, and in different affections of the Lymphatics, which it stimulates, in doses of gr. ¼ to gr. j. 2 or 3 times a-day, or applied in friction on the tongue.

OXIDES OF GOLD ($Au\ O_2$: $Au\ O_3$).—Oxygen combines with Gold in several proportions. A preparation, the *Purple Powder of*

Cassius, which has been long employed, is supposed to owe its efficacy to the presence of Deutoxide of Gold. It is obtained by precipitating Chloride of Gold with Protochloride of Tin, when what is supposed to be a Deuto-Stannate of Gold is obtained. This Oxide was the active ingredient of some old preparations, as the Crocus Solis.

PERCHLORIDE OF GOLD ($Au\,Cl_3$), formed when Gold is dissolved in Nitro-Hydrochloric acid, is very liable to decomposition. In action and virulence it is analogous to Corrosive Sublimate. It readily combines with other metallic Chlorides. To form the B. P. test solution 60 gr. of gold-leaf are dissolved in Aqua Regia, and the Terchloride produced dissolved in 5 oz. of dist. water.

CHLORIDE OF GOLD AND SODIUM ($Na\,Cl, Au\,Cl_3, 4\,H\,O$) is usually employed instead of the foregoing, as being more permanent in character and less costly. It is in elongated crystals, of a deep yellow colour, not alterable in the air, soluble in water. It consists of single equivalents of Chlor. Sodium and Terchloride of Gold, with 4 of water of crystallisation. It is the most to be depended on of these preparations. It may be prescribed in pill with Liquorice powder or Starch, or in solution. One mode of administering it is to divide the first grain into 15 parts, the second into 14, then into 12, 10, and so on, giving one of the fractional parts every morning. It has been given in ¼ and also ½ gr. doses ; or it may be applied by friction to the tongue mixed with three times its weight of Iris-root powder. (See Dict. Univ. de Matière Médicale of Merat and De Lens for a full article on this subject.)

PLATINUM. (B. Appendix.)

Platinum is found native, alloyed with other metals. It is of a greyish-white colour ; malleable and ductile ; Sp. Gr. 20·80 ; infusible at any heat, excepting that of the oxyhydrogen blowpipe ; unchanged by air or moisture ; insoluble in any acid but Nitro-hydrochloric (on account of the Chlorine which this contains). $Pt=98·5$. The metal may be obtained by igniting one of its salts, the oxide being reduced by heat ; or it may be precipitated from its solutions by nascent Hydrogen evolved from Zinc and dilute Sulphuric acid. It is thus obtained in a state of fine division, *Spongy Platinum*, which, when introduced into a mixture of Oxygen and Hydrogen, causes them to combine, with the evolution of heat.

PLATINI PERCHLORIDUM. (B. Appendix.) Perchloride or Bichloride of Platinum.—This salt ($Pt\,Cl_2=169·5$) is obtained by dissolving Platinum in Aqua Regia with the aid of heat, and evaporating the solution to a syrup, which, when cool, concretes into a crystalline mass. It is very soluble in water and in Alcohol. The aqueous solution precipitates solutions of Potash and Ammonia yellow forming

Platino-chlorides of Potassium and Ammonium. It does not precipitate Soda. Precipitates are thrown down from the solutions of most of the vegetable alkaloids.

The alkaline Platino-chlorides are even more insoluble in Alcohol than they are in water. Thus an alcoholic solution of this salt is often used as a test. The test solution of the B. P. is formed by dissolving in 5 oz. of dist. water the Perchloride obtained by acting with Nitro-hydrochloric acid on ¼ oz. of thin Platinum foil.

PART SECOND.

ORGANIC KINGDOM.

VEGETABLE MATERIA MEDICA.

Many of the most valuable medicinal articles in use in the present day, as in ancient times, are yielded by the Vegetable Kingdom in all parts of the world. Some of them are indigenous products, others are obtained by foreign commerce. All have particular soils and climates where they can grow in full health, and secrete the principles which make them useful as medicines in the fullest perfection. Some contain these diffused through their whole substance, when the whole herb or plant may be employed ; others store them up only in particular parts or organs, which therefore are alone employed. Or we may use in preference some proximate principle, separated either by nature or art from the rest of the vegetable matter. It is necessary, therefore, to be acquainted with the parts and products of plants, as well as with the best methods of preserveing or preparing them for medicinal use.

The parts of Plants which are used officinally, and which it is desirable to know, as well for the above purpose as for understanding the Classification employed in Botanical arrangements, are these :—

Flowering Plants.

1. *The Organs of Vegetation.*

Radix.—The root; usually sunk in the earth, serving to fix the plant and to absorb nourishment for its use. This it does through the naked extremities (*spongioles*) of its fibrils or radicles. Some roots are reservoirs of nutritious matter for the plants of the succeeding year; but most of these are rather Rootstocks.

Caulis.—The stem is that part of the plant situated between the root and leaves, and which usually supports the parts rising above the ground. The differences are apparently so great among stems, that different names are applied to different varieties ; they are, moreover, distinguished, according to duration, into *annual*, *biennial*, and *perennial*. They differ remarkably in their mode of growth; some, called EXOGENOUS, as those of all European trees, grow by the deposition of a layer of wood on the outside of that of the previous year, so that the oldest and most matured parts are in the centre, and the softer on the outside. Others, again, as Palms, grow only by additions to their centre, such additions being successively pushed outwards; so that the circumference becomes the hardest part of these stems. These are called ENDOGENS. The term ACROGEN is applied to those which are formed by the union of the bases of leaves and the original axis of the bud from which they spring, as in Ferns. Besides these there are also those which grow by simple elongation or dilatation, where no leaves or buds are produced.

The stem of Exogens is distinguished into various parts, as—1. The *Pith* in the centre, which is seldom used officinally, except in the case of that of the Sassafras; 2. The *Medullary sheath*, which surrounds the Pith; 3. The *Wood*, formed of concentric layers; and 4. The *Bark*, which lies on the outside, and is connected with the Pith by means of the Medullary rays. It is divisible into four layers,—the *Epidermis* on the outside, then the *Epiphlœum* and *Mesophlœum*, counting from without inwards, with the innermost of all, *Endophlœum*, commonly called *Liber*.

RHIZOMA, or Rootstock, differs so much in position from the Stem that it used to be considered a kind of Root; but it is, in fact, a prostrate thickened stem, which produces leaves from its upper, and true roots from its under side. Some of the Radices or Roots of former Pharmacopœias are called Rhizomes now, as that of common Ginger. A creeping stem, or root as it used to be called, is a kind of Rhizoma.

CORMUS.—This term, or Corm, is applied to what is essentially a kind of stem, though it remains under ground, and becomes of a roundish or ovoid figure, something resembling a Bulb in form, as in the Cormus of Meadow Saffron or *Colchicum autumnale*.

BULBUS.—A Bulb is roundish or ovoid, and consists of a flat fleshy disk, from the under surface of which true roots proceed, and on the upper surface arise fleshy coats, which are pressed close to each other either in an imbricate or tunicate manner, and enclose a true bud in their centre. Several are officinal, as those of Onion, Garlic, and Squill.

GEMMÆ.—Leaf-Buds are the rudiments of new shoots, and are either naked or protected by particular coverings called Scales. None are now mentioned in the Pharmacopœia, which used to specify those of Dyer's Oak, in an abnormal condition,—Gemmæ morbidæ (now *Gallæ*).

FOLIUM.—The leaf is usually a broad and thin expansion of vegetable tissue, of a green colour. It varies, however, very much in form and figure, so as sometimes to be thick and fleshy. It consists of—1. The expanded part called *lamina* or blade, one or both surfaces of which may be covered by *stomata* or breathing-pores; 2. The *petiole* by which it is attached to the stem, and where it is often supported by a pair of small leaves or *stipules*. The leaf may be simple or compound—that is, composed of several pieces united by a common petiole. It may have parallel or reticulate venation, and vary in a variety of ways. Many contain the most active principles of the plant, as those of Senna, Cajuputi, and others.

It is not necessary for the object in view to enter into the intimate texture of plants, or to describe the characters of Membrane and of Fibre, of Cellular or of Woody Tissue, or the peculiarities of the Vascular or of the Laticiferous Tissue.

2. *Organs of Reproduction.*

FLOS.—The Flower, when in the state of bud (Alabastrus), is, like the Leaf-Bud, surrounded by scales. The flower-bud consists of a fixed cellular central point, formed from the axil of a leaf, and surrounded by rudimentary leaves. The flower consists essentially of the *Stamens* and *Pistils*, or the parts concerned in fertilisation; but the term is commonly applied to the Floral envelope, consisting of the *Calyx* and *Corol*, usually supported by a *Bract* or Floral leaf, from the axil of which it proceeds. The apex of the pedicle, or the part of the plant to which the Flower is attached, is called the *Receptacle*, sometimes called *Thalamus* in compound words, as Thalamifloræ. Besides these, it is necessary to notice the disposition of Flowers on a plant, which is called their *Inflorescence*. All the parts of the flower, either separately or in their aggregate state, are employed medicinally; also the bracts, with the ultimate ramifications of the plant, when the whole plant, as in the Mints and other Labiatæ, is officinal; also the Cacumina, or Tops of plants, as of Rosemary, Santonica, &c.

CALYX.—The Calyx is the outer of a double whorl of floral envelopes, usually of a green colour; but when there is only a single whorl, then this is called the *Calyx*. Sometimes the term *Perianth* is applied when it is difficult to distinguish whether it be single or formed by the union of both calyx and corol. The Calyx is formed of one or more pieces, or *sepals*. Being exterior, it is necessarily always *inferior*, but being either unattached or adherent to the interior parts, it is in the latter case said to be *superior*, from being adherent to the ovary in its lower, and only free or visible as a distinct organ in its upper part. All the outside of the flower is calyx.

COROLLA.—The Corol is the inner of a double floral envelope, usually delicate in structure and brilliant in colour, consisting either of two or more pieces or *petals*, when it is said to be *polypetalous;* or these are united into one piece, when it is called *gamopetalous* by De Candolle, but *monopetalous* by most botanists. The petals of Roses are officinal.

STAMEN is the male organ, consisting of the *anther*, which is a case divided into cells, containing the *pollen*, a granular powder, or fecundating dust. The anther may be sessile ; or it is supported by a *filament* or androphore, a term which is usually applied where several are united together. When the stamen is adherent to the sides of the calyx, it is said to be *perigynous*, or surrounding the ovary ; but if united both with the calyx and the ovary, then it is said to be *epigynous*, or *upon* the ovary. But when it is quite free, the term *hypogynous* is used, indicating both its real and apparent position *below* the ovary.

DISK is a part not observed in all plants, but includes everything produced between the stamens and ovary : it used to be commonly called Nectary. It is annular, foliaceous, scale-like, or usually like small glands. It may be considered to represent a whorl of undeveloped leaves.

PISTILLUM.—The Pistil is the female organ, surrounded by the stamen and floral envelopes, consisting of the *ovary* divided into one or more cells, and containing one or more *ovules*, or the rudiments of future seeds. It is terminated by the *stigma*, which is properly a secreting surface, and humid to receive the pollen. The stigma is either sessile on the ovary, or separated from it by the *style*. In the same way that adherence of the calyx to the ovary makes it appear superior, so the ovary is in that case said to be *inferior;* but when the calyx is free and inferior, the ovary is *superior*.

The only part of an immature Pistil which is officinal is the Stigma of the Saffron Crocus.

The suppression of any of these whorls of the floral series produces a difference of character, which is expressed by a name ; as when the corol is absent, the flower is said to be *apetalous;* if the stamens are not developed, then the flower is said to be a *fertile* or *female* flower ; but if the pistil is suppressed, then it is called a *male* or *barren* flower.

FRUCTUS.—The Fruit is the ovary arrived at maturity ; with this some of the floral envelopes are occasionally united, and grow with it. The fruit consists of a *Pericarp* and of the *Seed* or *Seeds* enclosed within it. Some few, from being imperfectly covered, are called *naked seeds.* A fruit may be *simple* when produced by a single ovary, or *compound* when formed out of several ovaries. As the Pistil is considered by Botanists to be formed out of one or more modified leaves, which are then called *carpels*, so the fruit must be similarly constituted, and the number of cells, and the partitions by which these are divided, must depend upon the number of carpels of which the fruit is composed ; but it is observed that in consequence of some of the ovules becoming abortive, and the others growing inordinately, some of the cells may become abolished. It is therefore necessary to examine the ovary to ascertain the normal number of cells. As the fruit is the pistil arrived at maturity, it bears upon it some traces of the style, and necessarily consists both of the seed and of its covering or pericarp. It ought never, however small, to be called simply a seed. Therefore, in recent Pharmacopœias, many of the fruits are correctly so called, instead of being incorrectly denominated seeds (Semina). Many fruits are officinal, also the rind (Cortex) of some, and the pulp (Pulpa) of others; and in the case of the *Mucuna* and *Kamela*, even the hairs with which the fruit is externally covered.

SEMEN.—The Seed is the ovule (Vegetable Egg) arrived at maturity, and contains the rudiments of a plant similar to that by which it has been produced. It is attached by a funiculus to the inside of the ovary. It consists—1. Of the Integuments, *Tunicæ Seminales*, or Matured Sacs of the ovules. 2. Of Albumen (not always present). 3. Of the Amygdala or Kernels. Some seeds are naked, as in the true Gymnosperms. A few are imperfectly covered. All are marked with the *hilum* or *umbilicus*—the point where the seed was attached to the parent plant; often also with the *micropyle*, or minute hole which was the *foramen* of the ovule, and to which the radicle is always opposite. On the outside of the proper seed-coats we sometimes observe an *aril* (arillus), which is an expansion of the funiculus or of the placenta. That of the Nutmeg, known as Mace, is officinal. Sometimes the seed is covered with a hair-like substance, such as Cotton, officinal for making Pyroxyline.

AMYGDALA.—The Almond, or Kernel, consists of the Embryo, with or without Albumen. The *Albumen* or *Perisperm*, situated between the Seed-coats and Embryo, is a mass of cellular tissue filled with organic matter, which is, during germination, converted into nutriment for the young plant.

EMBRYO is composed of one, two, or more Cotyledons or seminal leaves of the young plant, which consists also of the Plumule and Radicle. The Embryo may be erect or pendulous, &c.

FLOWERLESS OR CRYPTOGAMIC PLANTS.

These plants, distributed into the natural groups of Ferns, Mosses, Lichens, Fungi, and Algæ, differ so much from others both in the parts of Vegetation and of Fructification, that they are generally treated of separately. Those, therefore, which afford any officinal plants will be mentioned in their proper places. It may suffice to state that their substance is composed chiefly of Cellular tissue, and that, being destitute of organs of fructification, they are propagated by *spores*, which differ from seeds in being free in their cavities, and in forming simple sacs, which germinate from any part of their surface.

CLASSIFICATION OF PLANTS.

Besides the parts of plants which are employed officinally, it is necessary to notice the mode in which plants are classified, as well for the purpose of understanding as for appreciating the advantages of the Natural Method of classification. Until of late years the artificial system of Linnæus was adopted in this country ; but botanists have now for many years been studying the natural affinities of plants. The publication in 1789 of the "Genera Plantarum Secundum Ordines Naturales Disposita" of A. L. de Jussieu, proved upon how satisfactory and comprehensive a basis such a classification might be formed ; and the series in which Jussieu first arranged them is probably as natural as any that has since been proposed. The corrections and additions made by Mr Brown in 1810 and subsequently, to the characters of many of these orders, gave them a stability which they have continued to retain. The system of the celebrated De Candolle of Geneva is now usually followed, not because it is considered perfect, but because under it, in his "Prodromus Systematis Naturalis," the greatest number of plants have been arranged, and thus the authors of several Floras have adopted it. It is the most convenient for reference, and serves as a good basis for studying the affinities of plants.

The parts of plants, or the compound organs of which they are formed, have been enumerated, but the internal structure requires also to be noticed. Dissection and the microscope show that plants are composed of Membrane and Fibre, formed into Cells and Ducts of different kinds, and into Woody, Vascular, and Laticiferous Tissues.

De Candolle* has laid it down as a fundamental proof of a classification being natural, that it arrives at the same results, whether considering the organs of reproduction or those of nutrition.

He first divides all plants, as Linnæus had already done, into Phænogamous and Cryptogamous, or into Flowering and Flowerless Plants. The former have the organs of Fructification, with their envelopes, disposed according to more or less of a symmetrical plan ; while the Cryptogamic plants have their reproductive organs, if any, disposed without any order, and their integuments obscured and irregular. If we look further to the parts of vegetation, we find that the Phænogamous plants are furnished with vascular tissue and with stomata, while the Cryptogamous have only cellular tissue, either during their whole life, or in their first foliaceous organs.

Phænogamous plants have been divided into *Dicotyledons*, or those which have two opposite or several whorled Cotyledons ; and into *Monocotyledons*, which have only one Cotyledon, or, if more than one, have them arranged alternately. The Dicotyledons, moreover, grow by additions of new layers on the outside of their woody texture, and are hence called Exogenous in growth, while the Monocotyledons grow by additions to their centre, and are hence called Endogenous.

Cryptogamous Plants may also be divided into two classes, the Ætherogamous and the Amphigamous, the first signifying that the fructification is unusual, having sexual organs visible under the microscope, but constructed upon a perfectly new plan. The *Amphigamæ* include those of which the fructification is doubtful, and such as display no sexual organs even under the microscope, though

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* Sur la Division du Règne Végétal. 1833.

it is possible that the spores may have become fecundated even within the cells, in cases where they are produced.

These Cryptogamous plants are also either *semivascular* or entirely *cellular*. This forms the main distinction between Acrogens and Thallogens, the two groups into which Cryptogamous plants are now generally divided. The former, which are the same as the Ætherogamæ, have their first leaves formed of cellular tissue only, and are without stomata; but at a later period of growth, they have vessels and stomata. The true Cellulares are entirely without vessels and stomata, and consist of a homogeneous mass, in which the distinction of stem, leaves, and roots is obtained only by comparison. But both these groups are usually included under the general term *Acotyledons*.

Hence we observe that the divisions formed from the Organs of Reproduction correspond with those taken from the Organs of Nutrition.

These classes are subdivided into smaller groups, under which the several Natural Families are arranged. (*See* p. 270.)

VEGETABLE PHYSIOLOGY.

The subjects which are comprehended in Vegetable Physiology are, the mode in which the functions of plants are performed, how they are enabled to grow, and how, in perfecting their secretions, they are influenced by the several agencies of Light, Heat, Air, and Moisture, as well as the nature of the nutriment afforded by the soil. This is interesting in a scientific point of view, and necessary to be studied, if it is wished to make any practical application of our knowledge of Plants to the arts of Agriculture or of Horticulture, or to the cultivation of Medicinal species. Also, if we are desirous of knowing the season of the year best suited to the collection of the different parts of plants, or wish to judge correctly of the situations in which they are most likely to secrete the principles which make them useful as Medicinal agents in their most efficient state.

Plants, not being endowed with voluntary motion, and unprovided with any *internal cavity* in which they may store up the fluids from which they are to derive nourishment, depend for these entirely on the soil in which they are fixed, and on the atmosphere by which they are surrounded. The nutriment absorbed by the aid of endosmose by the extremities of the root, passes from cell to cell, or along the vascular tissue of the middle of the roots, and then aided by capillary attraction and the void produced by evaporation from the surfaces of leaves, &c., ascends the stem chiefly in the course of the young wood; in early spring filling every part, that is, the cells, the fibres, and the vessels; but later in the season proceeding chiefly along the cells. In its course the watery fluid dissolves some of the organic matter stored up in the vegetable tissue, and is then denominated the *sap* of the plant. Arrived at the green shoots and surfaces of the leaves, which are covered with stomata, it is exposed to the influence of light, heat, and air. About two-thirds of the moisture taken up is now evaporated and exhaled; the remainder of course becomes inspissated. Some Carbonic acid is absorbed, and, as well as that obtained by the roots, becomes decomposed, the Carbon becoming fixed, and the oxygen set free.* Some water is also supposed to be decomposed, and its Hydrogen fixed; as also the Ammoniacal salts obtained from the soil are thought to furnish the supply of Nitrogen to the plant. Other decompositions also, and fresh combinations, probably take place among the elements of air and water, when the elaborated sap, consisting of fine granules, floating in a limpid fluid, begins to descend by the under surface of the leaf and along the bark, composed as this is of cellular tissue, elongated fibres, and laticiferous vessels. In these the processes commenced in the leaf are probably completed, as the sap takes either a direct or a circuitous course downwards, and allows these proper juices to become deposited in the bark, or distributed horizontally by the medullary rays to the centre of the stem, thus forming the difference between young wood (Alburnum) and heart-wood (Duramen); or else the greater portion may be conveyed downwards, even as far as the root.

The proximate principles secreted by plants, though very various in nature, are found to be composed of only a few elementary principles, that is, of Carbon, Oxygen, Hydrogen, and Nitrogen; though their proportions are complex, and the equivalent numbers of the compounds high. To give a general view of the subject, these may be arranged in a tabular manner.

1. Compounds which contain Carbon, and Oxygen and Hydrogen in the same proportion as in water; sometimes called Hydrates of Carbon. (Ternary.)	Starch, Dextrine, Cane Sugar, Grape Sugar, Gum, Cellulose.
2. Neutral Azotised substances generally diffused through plants. (Quaternary.)	*Fibrine* insoluble, and *Caseine* soluble, in cold water. *Albumen*, coagulated by heat. *Gluten*, a tenacious and elastic compound of Fibrine and of an Azotised principle.
3. Ternary inflammable compounds (containing no Nitrogen), in which Hydrogen is in excess.	Ligneous tissue, Fixed Oils, Stearine, Margarine, Elaine, Volatile Oils (some of these contain no Oxygen, others contain Sulphur), Camphor, Balsams, Oleo-Resins, Resins, Gum-Resins, Wax.
4. Vegetable alkalies, and neutral principles, composed of Carbon, Oxygen, Hydrogen, Nitrogen. (Quaternary.)	Morphia, Narcotine, Codeia, Quinia, Cinchonia, Digitaline, Strychnia, Aconitia, Veratria, Atropia, &c.

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* Plants in the dark and at night exhale Carbonic acid and absorb Oxygen, as do seeds during germination, and flowers during expansion, as in the Arum.

5. Vegetable acids. Oxygen in excess, or in greater proportion than in water. (Ternary.)	Citric, Tartaric, Pectic, Malic, Acetic, Tannic, Gallic, Oxalic, Meconic, &c. (Hydrocyanic acid is a compound of Hydrogen and the radical Cyanogen.)

Many acids, like the above alkalies, are peculiar to particular kinds of plants; other principles are more general, but not universal, as Colouring matter. Some products, moreover, are obtained from plants by the processes of Fermentation, by the action of Heat, or the operation of Chemical reagents.

Some of these principles are supposed to contribute more directly than others to the nourishment and growth of the plant itself. Thus Cellulose, Starch, and Dextrine are nearly identical in composition, and one may easily be changed into the other. For the Starch, insoluble in water, may be converted into the soluble Dextrine, and even into Sugar, by *Diastase*, a singular azotised substance found in germinating seeds, also near buds and the eyes of potatoes when beginning to sprout. The Starch, before it is stored up, may thus be converted into a soluble syrup, or spread out into a membrane to forms the walls of cells and vessels. The azotised principles, being generally present, are also supposed to contribute to the nutrition of the plant. They are, at all events, remarkable for corresponding in composition and properties with the principles of the same name obtained from the blood and milk of animals. By a diminution or increase taking place in the number of equivalents of any of the elements composing these principles, there may ensue an excess of Oxygen, of Hydrogen, of Carbon, or of Nitrogen. Thus Ligneous tissue is supposed to increase its proportion of Carbon as well as of Hydrogen, and hence to be more combustible than Cellulose. As the effect of the respiration of plants, when exposed to light, is to fix the Carbon and set free the Oxygen, this would of itself leave an excess of Hydrogen; and to this is ascribed the properties of some substances found in the descending sap of the bark, as Chlorophyll, Latex, Resins, Essential Oils, Wax. The Fatty Oils are usually secreted only by the fruit; as in the sarcocarp of the Olive, Melia, and some Palms, but they are generally confined to the kernel of the seed.

When the proportion of Oxygen is increased, acidification takes place, and the several vegetable acids are formed; some found in a great variety of plants, others peculiar to individual species. But, as in the case of the mineral acids, Hydrogen is sometimes the acidifying principle, as in Hydrocyanic acid. The formation of the oxyacids, it is supposed, is favoured by nocturnal respiration, when some Oxygen is absorbed. It takes place in parts exposed to light, but which are not of a green colour, as in a variety of fruits, and in some roots. It has further been observed that the nascent parts of plants abound in azotised principles; and though seeds contain a supply of Nitrogen, this is soon exhausted by the growing plant, and a fresh supply must be obtained from the soil, which is derived chiefly from the Ammoniacal salts held in solution by the water absorbed by the roots. In connection with these may be mentioned the influence of the mineral contents of the soil. It is evident that as clay retains moisture, and sand allows water to percolate through it, such a mixture of the two as will hold the moisture without becoming wet, and yet allow the air to penetrate into the soil, must have a beneficial influence on vegetation. Other mineral substances, such as Gypsum, Oxides of Iron, and Alumina, are useful in fixing Carb′ and Ammonia. Some salts, being taken up by the water, must combine with the ordinary vegetable acids (No. 5), and are necessarily the source of the saline ashes which remain when plants are burnt. Some inorganic matters are essential to the constitution of the plants, as Phosphates to the grain of the Cereals, and Silex to the straw of Grasses.

Seeing, therefore, that the rate of absorption by the roots depends as well upon the moisture of the soil as does the rate of evaporation from the leaves upon the dryness of the atmosphere, we require no further proof to perceive how much the functions of plants must be controlled by such physical agents as Light, Heat, Air, Water, and the nutriment these last afford, and how interesting and important must be the study of the functions of plants: for upon the due performance of these not only depends the proper elaboration of medicines, but of the principles which are to afford nourishment to all the vegetable feeders of the animal kingdom.

GEOGRAPHY OF PLANTS.

Having found that the growth of plants, and the nature of their secretions, are so much affected by different physical agents, we may conclude that there are particular sets of plants fitted by nature for the particular circumstances in which they are placed. The Tropical Zone is characterised by brightness of light, great heat, and moisture. These conditions are all favourable to the development of plants, which are accordingly characterised by vastness of size, their foliage by richness, and their inflorescence by brilliancy of colouring. From these regions, moreover, the rest of the world is supplied with aromatics and spices. Tropical climate is not terminated by an abrupt line; but, according to the influence of local causes, is extended into higher latitudes, carrying with it the peculiarities of tropical vegetation. As also, in ascending mountains, the diminution of temperature being gradual, so is the disappearance of the vegetable forms growing at their base; and we find plants diminishing in number and in size as we ascend lofty mountains. Luxuriant vegetation, however, is not confined to tropical countries; for temperate climates can equally boast of beauty and variety of scenery, where the Pine tribe are conspicuous. Oaks, with other catkin-bearing trees, form valuable timber, and the small Labiatæ represent the aromatics of southern regions. Between these extremes there are many gradations of temperature, of moisture, and of dryness, all of which influence the nature of the vegetation and the secretions of plants; as, for instance, in the tract of country which is beyond the reach of tropical influence, and yet not so cool or so moist as European regions, but where the atmosphere is clear and dry, the temperature hot, and the soil apparently barren. All this being favourable to the due secretion of vegetable products, we obtain from Persia, Arabia, and parts of Africa, many most important drugs. Therefore, in visiting or sojourning in different countries, when acquainted with the principles of geographical distribution, we know what groups of plants to expect, and what we may hope successfully to cultivate; so also in cultivating or collecting medicinal plants in our own country, we shall, by the same knowledge, be better able to weigh the influences of soil and of aspect.

Medical Properties of Natural Families of Plants.

The connection between the medical properties of plants and their structure was a subject noticed by Cæsalpinus, Camerarius, Petiver, and Linnæus, but has been paid much more attention to since the publication by De Candolle of his "Essai sur les Propriétés Médicales des Plantes." As the author has elsewhere said—"In this work he has shown that, as the effects on the system of the different substances used as medicines must be owing either to their physical characters or their chemical composition, so must these depend on the peculiar organisation of the vegetable, especially in the organs of nutrition, by which they are secreted. But as plants are classified from their organs of reproduction, and not from those of nutrition, it does not appear how we are led to the nature of the secretions formed by these from a consideration of groupings founded on the examination of a different set of organs. To this it has been well replied, that though an artificial arrangement may draw the characters of its classes from as small a number of organs as possible, the natural method is, on the contrary, the more perfect in proportion as the characters of its classes express a greater number of ideas. Hence those families which present the greatest number of points of analogy in the organs of reproduction will also display them in the organs of nutrition, in which the secretions are chiefly performed. Thus the division of vegetables from the seeds into Acotyledons, Monocotyledons, and Dicotyledons, agrees with that taken from the existence and disposition of a vascular system. Hence the structure of the organs of reproduction may be a sufficiently certain index of the structure of those of nutrition; but as these determine the nature of the secretions or products of plants, so it follows that the properties of plants may be in accordance with their classification into natural families."

As examples, we may adduce the Gramineæ as yielding all our Cereal grains. The Palms afford Starch, Sugar, and Oil. The Coniferæ, Turpentine, Resin, and Tar, in whatever part of the world they are found. The Labiatæ yield Volatile Oil; the Solaneæ secrete narcotic, the Convolvuli, cathartic, and Gentianeæ, bitter principles, both in hot and cold parts of the world. Numerous other instances will be adduced in the course of the work. Exceptions no doubt occur; but agreements of properties with structure are so numerous, that in no other way can we get so much information, or so readily find a substitute for a medicine or an equivalent for an article of trade, as by seeking for it in the families of plants which are already known to produce substances of similar properties in other parts of the world. This is no trivial advantage, if we consider only the immense extent and varied climates of the British dominions, visited as they are by the medical officers of the Army, as well as by those of the Royal and Mercantile Navy.

THE COLLECTING AND DRYING OF VEGETABLES.

As the medical and other properties of organised bodies depend not only on the peculiar secretions of each particular species (differing often in different parts or organs of each), but also on these secretions having been duly elaborated under the suitable influence of physical agents; so in the collecting of plants, we must pay attention not only to the genuineness of species and to their products, but also to the influence of Age, of Habit, of Season, of Situation, and Aspect, as well as to their being wild or cultivated. Care must, moreover, be taken that their secreted principles do not become decomposed by exposure to humidity, or too much light, heat, or air. No general directions on the mode of collecting vegetables are given in the B. P., but in the L. P. were the following instructions, which should be attended to in most cases:—

"Vegetables should be collected in dry weather, and when moist neither with rain nor dew. They should also be collected annually, and those which have been kept longer than the year should be rejected." This has reference to herbaceous plants, which should be collected only when in full perfection—that is, when they contain the principles which make them useful as medicines in the fullest perfection. The period may therefore differ according as we seek only for mucilaginous principles, or for those which present the concentrated essence of a plant in the form of an alkali.

Shortly after gathering, those which are not to be used in a fresh state should be lightly strewed, or put in paper bags, and dried as quickly as possible with a gentle heat, in a dark airy place, taking care that the green colour is not injured by too much heat; then pulverise immediately, if required in powder, and preserve in proper vessels excluded from light and moisture. Herbs and flowers for the preparation of oils and distilled waters should be used as soon as collected.

"Most Roots and Rhizomes are to be dug up when the leaves and stalks have fallen, and before the new ones appear." All intended to be preserved should be dried as soon as possible after they have been dug up. The large true roots, especially the more juicy, dry better in their entire state than when sliced, and their juices are not then exposed to the influence of the atmosphere. The roots which are to be preserved fresh may be kept in dry sand.

"Barks should be collected at that season in which they can most easily be separated from the wood." This in general is the case in spring. The Oak is known to yield a larger quantity of Tannin when barked then than at any other season.

"Herbs and Leaves are to be gathered after the flowers have expanded, and before the seeds ripen." Mr Battley's directions are that the leaves should be freed from their stalks before being powdered or used medicinally. But it is sometimes preferable to allow them to dry while attached to the stalks. They may then be laid in thin layers in baskets of willow stripped of its bark, in a drying-room kept quite dark. They should then be exposed to a temperature of 138° to 140° F. for six or eight hours. The leaves then having shrivelled, should be turned, and the same temperature continued until they crumble readily in the hand. The leaves so dried retain their green colour, and in a high degree their medical properties. They should finally be preserved in dry and clean jars closely covered, and powdered as required. Dr Houlton believes that the juices of leaves are less liable to deterioration by being inspissated in their own cells than when they are formed into extracts, however carefully the process may be conducted.

"FLOWERS should be collected when just blown." But the petals of the Red Rose are directed to be gathered just before they blow.

"FRUITS and SEEDS are to be collected when just ripe."

PULPY FRUITS, if they are unripe, or if ripe and dry, are to be put in a moist place, that they may become soft; then press the pulp through a hair sieve; afterwards boil them over a slow fire, frequently stirring; lastly, evaporate the water in a water-bath until the pulps become of a proper consistence. Press through a sieve the pulp or juice of ripe and fresh fruits, without any boiling water being used, as in the case of the bruised pods of CASSIA.

SUCCI SPISSATI. Inspissated Juices.—The freshly-gathered herb is strongly pressed in order to obtain the juice; this is usually (B. P.) heated to 212° to coagulate the albumen, which is separated by filtration. The liquid is then gradually evaporated at a temperature of 140° or 160°. These inspissated juices (as of Aconite, Belladonna, Colchicum, Hemlock, Henbane, Taraxacum), are not distinguished by name in the B. P. from the extracts obtained by evaporating the watery or spirituous solutions of different vegetable substances, and which form true Watery or Spirituous Extracts.

TABLES OF NATURAL ORDERS OF PLANTS.

A series of Analytical Tables of the Natural Orders yielding officinal plants will now be given, in the stead of that detailed account of their several botanical characters which may be sought for in systematic treatises on Botany. The more prominent and important marks of difference between the officinal orders may, it is hoped, be clearly learnt from the following tables, and thus the space which would otherwise have been devoted to such details in the body of the work will be gained for other matters.

ANALYTICAL ARRANGEMENT OF THE CLASSES AND ORDERS OF OFFICINAL PLANTS.

CLASS I. EXOGENÆ.—*v.* DICOTYLEDONES.

Sub-class I. *Thalamifloræ.*

A calyx and corolla. Petals distinct. Stamens hypogynous.

Sub-class II. *Calycifloræ.*

A calyx and corolla. Petals distinct. Stamens perigynous or epigynous.

Sub-class III. *Corollifloræ.*

A calyx and corolla. Petals united into one, which usually bears the stamens.

Sub-class IV. *Apetalæ.*

No corolla, and sometimes no calyx.

CLASS II. ENDOGENÆ.—*v.* MONOCOTYLEDONES.

CLASS III. CRYPTOGAMÆ.—*v.* ACOTYLEDONES.

Sub-class I. *Acrogenæ.*

Growing upwards; consisting of cells and vessels.

Sub-class II. *Thallogenæ.*

Growing in all directions; consisting of cells only.

CLASS I.—EXOGENÆ.—SUB-CLASS I. THALAMIFLORÆ. (24.)

A. *Placentæ folial or axile*—(*i.e.* corresponding to the united edges of infolded carpels).

1. Embryo small; albumen large.	Ovaries many, distinct.	Stamens indefinite.			Fl. mostly quinary; *albumen horny;* seeds without arillus	*Ranunculaceæ.*
					Fl. ternary; *albumen fleshy;* seeds with an arillus	*Magnoliaceæ*
	Ovary single, compound.				Stamens equal to and opposite petals	*Ampelideæ.*
					Stamens indefinite	*Canellaceæ.*
2. Embryo about equal in amount to albumen.	Sepals imbricate.	Flowers diœcious.			Sepals and petals alike; irregular in number; plants climbing	*Menispermaceæ.*
		Flowers hermaphrodite.	Stamens free.		*Ovaries separated;* leaves with pellucid dots	*Rutaceæ.*
					Ovaries united; leaves without dots	*Zygophyllaceæ.*
			Stamens united.	Flowers regular.	*Corolla twisted;* ovary many-celled, with spurious dissepiments	*Linaceæ.*
					Corolla twisted; ovary many-celled. with *no* spurious dissepiments	*Oxalideæ.*
					Corolla not twisted; fruit a berry	*Meliaceæ.*
				Flowers irregular.	5 sepals, 2 inferior and petaloid; flowers papilionaceous	*Polygaleæ.*
	Sepals valvate.				Stamens monadelphous; pollen smooth	*Buttneriaceæ.*
3. No albumen in seed.	Calyx valvate.				Stamens indefinite, monadelphous; ovaries in a circle; corolla twisted; pollen rough	*Malvaceæ.*
	Calyx imbricate.	Stamens indefinite.	Leaves alternate.		Stipules large, convolute; calyx-winged, persistent	*Dipterocarpeæ.*
					Stipules none, or small; calyx not winged, deciduous	*Ternstræmiaceæ.*
			Leaves opposite.		Leaves coriaceous, without stipules; sepals persistent; stigma sessile	*Guttiferæ.*
		Stamens definite.	Leaves dotted.		*Fruit syncarpous,* consolidated; stamens free, or in parcels	*Aurantiaceæ.*
					Fruit at length apocarpous; pericarp separating into two layers	*Diosmeæ.*
			Leaves without dots.		*Corolla regular;* fruit at length apocarpous	*Simarubeæ.*
					Corolla irregular; fruit two-celled, syncarpous	*Krameriaceæ.*

B. *Placentæ parietal*—(*i.e.* corresponding to the sides, or united edges, of extended carpels).

Placentæ opposite to carpels.	*Stamens 5,* with filaments extended; embryo straight, with albumen	*Violaceæ.*
	Stamens indefinite in number; embryo curved, with albumen	*Cistineæ.*
Placentæ alternate with carpels.	*Placentæ opposite lobes of stigma;* stamens 6; flowers tetramerous; seed exalbuminous	*Cruciferæ.*
	Placentæ alternate with lobes of stigma; stamens indefinite; seeds albuminous; fl. usually tetramerous	*Papaveraceæ.*

SUB-CLASS II. CALYCIFLORÆ. (12.)

A. *Ovary superior*—(Stamens perigynous).

Albumen absent.	Fruit a legume.			Flowers papilionaceous, or regular; odd sepal below; stamens adelphous, or free	*Leguminosæ.*
	Fruit not a legume.	Stamens many.	Fruit superior	*Achenia, or follicles;* flowers regular; odd sepal above; stamens often indefinite	*Rosaceæ.*
				A single drupe; flowers regular; odd sepal above; stamens about 20	*Amygdaleæ.*
			Fruit enclosed by the fleshy calyx	*A pome;* flowers regular; odd sepal above; stamens indefinite	*Pomaceæ.*
		Stamens few.		*Ovary single,* one-celled, one-seeded; sepals, petals, and stamens, usually five	*Terebinthaceæ.*
				Ovaries many, distinct or coherent; plants succulent; stamens = or twice the petals	*Crassulaceæ.*
Albumen present.				Stamens definite, opposite the petals; ovary two or more celled, few-seeded	*Rhamnaceæ.*

B. *Ovary inferior*—(Stamens epigynous).

Flowers hermaphrodite.	Albumen absent.	*Fruit of many cells, in one row;* leaves with pellucid dots and intramarginal veins; stamens numerous	*Myrtaceæ.*
		Fruit of many cells in two rows; leaves without dots, and no intermarginal veins; stamens numerous	*Granateæ.*
	Albumen present.	*Fruit didymous;* flowers in umbels; stamens and petals five; styles two; leaves mostly divided	*Umbelliferæ.*
		Fruit three or more celled; flowers often in umbels; styles three or more; leaves often entire	*Araliaceæ.*
Flowers diclinous.		Plants climbing; flowers quinary; anthers sinuous; fruit fleshy, one-celled, with three many-seeded placentæ	*Cucurbitaceæ.*

SUB-CLASS III. COROLLIFLORÆ. (15.)

A. *Ovary superior*—

- (Stamens hypogynous). Leaves evergreen; anthers two-celled, opening by pores; ovary many-celled; seed albuminous . . . . . *Ericaceæ.*
- (Stamens perigynous).
  - Flowers regular.
    - Albumen absent. Leaves alternate; calyx imbricated; corolla plaited; stamens, five; ovary two—four celled . . . . . *Convolvulaceæ.*
    - Albumen present.
      - Placentæ parietal. Leaves opposite; ovary one-celled, with two placentæ, many-seeded . . *Gentianeæ.*
      - Placentæ axile.
        - Stamens free.
          - Stamens 2 or 4. *Leaves opposite;* corolla four-parted; ovary two-celled . . . *Oleaceæ.*
          - Stamens 5 or more.
            - *Leaves alternate;* corolla five-parted; ovary two-celled . . . *Solaneæ.*
            - *Leaves opposite;* corolla five-parted; ovary two-celled . . . *Loganiaceæ.*
        - Stamens adherent. Leaves alternate; calyx persistent round fruit; ovary two—five-celled . . . *Styraceæ.*
  - Flowers irregular.
    - Albumen absent. Stamens didynamous; ovaries four; flower lipped; leaves opposite . . . . *Labiatæ.*
    - Albumen present. Stamens didynamous; ovary single, two-celled; flower variable . . . . *Scrophularineæ.*

B. *Ovary inferior*—(Stamens epigynous).

- Anthers distinct.
  - Leaves whorled. Corolla rotate; fruit two-celled, two-seeded; albumen present . . . . *Rubiaceæ.*
  - Leaves opposite.
    - With interpetiolar stipules. Corolla regular, stamens alternate with lobes; albumen present; fruit mostly two-celled . . . *Cinchonaceæ.*
    - Without stipules.
      - *No pappus;* flowers corymbose; fruit one—five celled; albumen present . . . *Caprifoliaceæ.*
      - *Calyx pappose;* corolla three—six lobed; fruit three-celled, one-seeded; albumen none . . . *Valerianaceæ.*
- Anthers united.
  - *Flowers distinct;* corolla irregular, five-lobed; stamens five; fruit one—three-celled, many-seeded; no pappus; albumen present . . . *Lobeliaceæ.*
  - *Flowers united on capitula;* corolla ligulate or tubular; fruit one-celled, one-seeded, crowned by pappus; stamens five; albumen none . . . *Compositæ.*

Sub-class IV. Apetalæ. (12.)

A. *Flowers perfect.*

Ovary superior.	Stamens hypogynous; seeds albuminous.		*Stipules tubular; calyx imbricate;* fl. mostly in racemes; ovary one-celled, one-seeded, triangular	*Polygonaceæ.*
			No stipules; no calyx; stem articulated; fl. in spikes; ovary one-celled, one-seeded, round	*Piperaceæ.*
	Stamens perigynous; albumen none.	Ovary *one-celled.*	*Anthers opening by valves, two—four-celled;* stigma two—three-lobed. Trees	*Laurineæ.*
			Anthers opening lengthwise, two-celled; stigma undivided; calyx coloured. Shrubs	*Thymeleæ.*
		Ovary *two-celled.*	Trees; calyx membranous; fruit winged; cotyledons foliaceous	*Ulmeæ.*
Ovary inferior.	Wood without concentric zones; calyx often very irregular; stamens often gynandrous; ovary six-celled			*Aristolochieæ.*

B. *Flowers unisexual.*

Angiospermous; seed in an ovary.	Flowers in *catkins.*		Albumen none; ovary one—two-celled; seeds one or many; fem. flowers sometimes solitary. Trees	*Amentaceæ.*
	Flowers not in *catkins;* ovary superior.	Ovary one-celled.	*Embryo small;* seed one, albuminous; calyx trifid, cup-shaped; stamens often united; fruit, a berry	*Myristicaceæ.*
			Embryo large; seeds one—two, albuminous; fruit variable	*Urticaceæ.*
		Ov. generally three-celled.	Calyciform involucra; often no calyx; seeds few, albuminous	*Euphorbiaceæ.*
Gymnospermous; seed naked.	Stem branched.		*Leaves linear;* stamens in catkins, one or monadelphous; seeds in axils of carpellary leaves, arranged in cones	*Coniferæ.*
	Stem simple.—		*Leaves pinnate;* male flowers in terminal cones; stem cylindrical	*Cycadeæ.*

CLASS II. ENDOGENÆ.

Endogenæ. 10.

A. *With a perianth.*

Ovary superior	Perianth coriaceous, six-parted.		Trees; leaves generally pinnate; flowers mostly unisexual, on a branched spadix	*Palmæ.*
	Perianth coloured, six-parted.	Style undivided.	Stamens six; anthers introrse; ovary three-celled	*Liliaceæ.*
		Style divided.	Stamens six; *anthers extrorse;* ovary three-celled, three-parted	*Melanthaceæ.*
			Stamens six; *anthers introrse;* ovary three-celled; leaves net-worked	*Smilaceæ.*
Ovary inferior	Stamens three, fertile.		Anthers extrorse; ovary three-celled; style one: bracts sheathing flowers	*Irideæ.*
	Stamens mostly aborted.	Anther one, with a filament.	*One loculus;* sepals three; corolla very irregular; filament petaloid	*Canneæ.*
			Two loculi; sepals three; corolla irregular; filaments not petaloid	*Scitamineæ.*
		Anthers one or two, gynandrous.	Sepals three; pet. three, irregular; ovary one-celled; placentæ three, parietal, many-seeded	*Orchideæ.*

B. *No true perianth.*

Flowers on a spadix.	Fl. hermaphrodite, surrounded by scales; ovary superior, one or more celled	*Acorineæ.*
Flowers glumaceous.	Fl. perfect, or unisexual, in spikelets, each surrounded by two—three series of imbricated bracts; ovary superior; seed one, albuminous	*Gramineæ.*

CLASS III. CRYPTOGAMÆ.

SUB-CLASS I. ACROGENÆ. (1.)

A rhizome, or stem, having leaves or fronds with a dichotomus venation, and generally bearing beneath them *thecæ*, or cases of spores	*Filices.*

SUB-CLASS II. THALLOGENÆ. (3.)

Growing on land; consisting of a membranous expansion; spores beneath *apothecia*, disks which burst up from the cortex	*Lichenes.*
Growing in water; leafy, cellular, or filamentous; spores in *thecæ*, or receptacles, situated in various parts . .	*Algæ.*
Growing in moist places; form diverse; spores loose, or in *sporidia*, membranous cases	*Fungi.*

Class I. DICOTYLEDONS *vel* EXOGENÆ.

Sub-class I. THALAMIFLORÆ.

RANUNCULACEÆ, *Jussieu*. Crowfoots.

Ranunculaceæ are found in most parts of the world where the soil and climate are not very hot and dry. They therefore indicate moisture of soil with moderate temperature of climate.

Properties.—A few of the Ranunculaceæ secrete a bitter principle, but most abound in an acrid principle, volatile in nature and destructible by heat, which makes the leaves and roots of several useful as Rubefacients and Caustics when applied externally, or causes them to act as Irritants when taken internally. In others, peculiar Alkalies have been detected which make them useful as Sedatives, and in larger doses to act as poisons. Various species of Ranunculus, especially the indigenous *R. Acris*, and *R. Flammula*, have been employed in medicine for their acrid and rubefacient properties.

[HELLEBORUS, L. Rhizoma et Radix. The Rhizome and Root of Helleborus Niger, *Linn.*

Black Hellebore, so called from the colour of its roots, or Christmas Rose, from flowering in winter, is a native of the shady woods of the lower mountains of many parts of Europe. It is now rarely used, and is omitted in the B. P.

Bot. Ch.—The plant is herbaceous, with a perennial blackish-coloured rhizoma, tuberculated and scaly, from which descend numerous thickish radicles. The leaves which sometimes make their appearance after the scape, are radical, with long, cylindrical, and spotted foot-stalks, pedately divided, with the lobes from 7 to 9, oblong lanceolate, sometimes cuneate-obovate, largely serrated towards their apices, and arranged apparently along the forked terminations of the petiole; they are stiff, almost leathery, of a dirty green colour, smooth above, paler and reticulate beneath. The scape is shorter than the petiole, furnished with two or three oval bracts, often simple and single-flowered, sometimes forked and two-flowered. The flower is large, terminal, white, with a tinge of pink, the most conspicuous part being the petaloid calyx: of this the sepals are five, ovate, and permanent. The petals, 8 to 10, are small, greenish-coloured, tubular, tapering towards the base, with the limb tubular, bilabiate, and their outer margins terminated in a tongue-shaped lip. Stamens numerous, longer than the petals. Ovaries 6 to 8. Stigmas terminal, orbiculate. Capsules follicular, leathery. Seeds many, elliptical, umbilicated, arranged in two rows.—Jacq. Fl. Aust. t. 201. B. M. t. 8.

Hellebore root is usually imported in bags and barrels from Hamburgh, and sometimes from Marseilles. (*p.*) French authors state that it is obtained from Auvergne and from Switzerland. The so-called roots consist of the root-stock and of the radicles; the latter are chiefly recommended; the former, some inches long, and half-an-inch thick, straight or contorted, is marked with transverse ridges, being the remains of the leaf-stalks, and on the under surface with long fibres, all more or less of a dark brown colour, having internally a white point in the centre. The odour of the dried root is feeble, but has been compared by Geiger to that of Senega root. The taste at first sweetish, soon becomes bitter and nauseously acrid. Dr Christison says he did not observe the roots to be acrid in February, and that the dried roots are not acrid. (Goebel and Kunze, 11. Tab. xxxi. fig. 1, a.)

Prop.—Hellebore root has not yet been satisfactorily analysed. Feneulle and Capron found in it both a Volatile and a Fatty Oil, a Volatile Acid, Resinous matter, Wax, a Bitter principle, Mucus, Ulmine, Gallate of Potash, Supergallate of Lime, and an Ammoniacal salt. They ascribe the activity of Hellebore to the union of the concrete oil with the volatile acid. As the root loses some of its efficacy by drying, and also by long keeping, it requires to be frequently renewed. Water extracts some of its virtues, but Alcohol is the best menstruum.

There are some other species of Hellebore which deserve notice.

Fig. 35.

Helleborus officinalis of Dr Sibthorp (fig. 35), found by him on hilly ground in Greece and the Levant, has been figured in Fl. Græca, t. 583. It was considered by Dr S. to be the Black Hellebore of Dioscorides, being still used and called Zoptima by the Turks, and Σκαρφη by the Greeks. Fig. 35.—1. A sepal with petals attached; 2. Sepals, &c., removed to show the pistils with a stamen and petals.

Helleborus viridis.—Green Hellebore roots are often mixed with those of the Black Hellebore on the Continent, and are said to be efficient substitutes. H. fœtidus, or Bearsfoot Hellebore, has its leaves still officinal in the United States. They are acrid, emetic, and cathartic, and were formerly employed as Anthelmintics. The roots of *Actæa spicata* are sometimes intermixed with Hellebore, and are figured with the above by Goebel and Kunze.

Action. Uses.—The fresh root of Hellebore applied to the skin induces inflammation and vesication. Given internally, it acts as an irritant to the intestinal canal, producing vomiting and purging, and in some cases inflammation of the rectum. It is Purgative and Emmenagogue.

Dose.—Hellebore is sometimes prescribed in fresh-made powder, in doses of from gr. x.–gr. xx., as a drastic purgative, but in gr. iij.–gr. viij. for milder effects. Of the infusion (gr. cxx. to Aq. ferv. Oj.) f℥j. every four hours. An alcoholic extract is an efficacious preparation.

Tinctura Hellebori, L.

Prep.—Macerate *Bruised Hellebore* ℥v. in *Proof Spirit* Oij. for 7 days, then press, and strain.

Dose.—fʒß to f℥j. as an adjunct to draughts. Seldom used.]

[Staphisagria, L. Semina. The Seeds. Delphinium Staphisagria, *Linn.* Stavesacre. *Polyandria Trygynia*, Linn.

Stavesacre is a plant of the south of Europe and of the Mediterranean islands, identified by Dr Sibthorp as that employed in medicine by the Greeks. It is often confounded with *D. pictum* and with *D. Requienii.* Omitted in the B. P.

Bot. Ch.—The plant is biennial, and hispid, with a tall herbaceous stem. Leaves broad palmately 5-9 cleft, segments entire or trifid, pedicels tribracteate at their base. Flowers in a lax raceme, with 5 petaloid sepals, the upper one shortly spurred, petals four, united at the base, and beardless, the two upper extended into appendages enclosed within the spur, the two lower spathulate, capsules 3 ovate ventricose. Seeds numerous.—Fl. Græca, t. 508.

Prop.—Stavesacre seeds are imported from the south of Europe. Those from Germany are said to be very good. All are of an irregular triangular shape, rough dotted surface, and brownish colour, of little odour, but having a bitter and acridly burning taste. The properties of these seeds depend on an alkaloid called *Delphinia*, and on a volatile acid, which has been thought analogous to the acrid principle of other Ranunculaceæ, but is perhaps only the Malic with a Volatile Oil. The other constituents are a Fatty Oil, Gum, Starch, Azotised matter, Albumen, and several salts.

Delphinia was obtained by Couerbe by acting on the alcoholic extract of the seeds with boiling water acidulated with Sulphuric acid, and then precipitating the Delphinia from the solution by means of Ammonia ; or boil the watery extract with Magnesia, filter the residue, boil with Alcohol, and evaporate the solution. This Delphinia is pure enough for medical purposes, but is still mixed with another substance called Staphisin. *Delphinia* is white, powdery, but crystalline, very bitter and acrid, fusible like wax, nearly insoluble in water, soluble in Alcohol and Ether, forming salts with acids, which are also very bitter.

Action. Uses.—Stavesacre seeds and Delphinia are acrid poisons ; the former have been employed to kill pediculi. An Alcoholic solution rubbed on the skin produces burning and tingling, and is hence used as a counter-irritant. Internally, the seeds have been given as Emetics and Cathartics, but are too violent ; also sometimes in infusion as Anthelmintic. In large doses, Narcotic.

TINCTURA *vel* SOLUTIO DELPHINIÆ.—Dissolve *Delphinia* gr. xl. in *Rectified Spirit* f℥ij. Useful as an embrocation in Neuralgic cases and in chronic Rheumatism. Or employ the following :—

UNGUENTUM DELPHINIÆ.—Rub up *Delphinia* gr. xxx. with *Olive Oil* f℥j. and *Lard* ℥j. But the Aconite preparations are preferable.]

ACONITI FOLIA, B. ACONITI RADIX, B. Aconite Leaves and Root. A. Napellus, *Linn.* Aconite. Monkshood. *Polyandria Trigynia*, Linn.

The name Aconitum, or Monkshood, is derived from the Greek *akoniton*, stated by Theophrastus to be a virulent poison. Dioscorides describes three or four kinds : of these, one agrees a little with the description of an Aconite, and may be *Aconitum Napellus*, Linn., found in the mountains of Italy and of Greece, where it is still known by the name of ακονιτον. It is also found in the mountainous pastures and cold hills of many parts of Europe, and is a doubtful native of this country, being sometimes found on the banks of rivers and brooks. As it is the most common species, and the only one procurable to any extent by druggists, it is retained as the officinal one, instead of *A. paniculatum*, which was formerly selected by the L. and D. P. *A. Stoerkianum*, Reich. (*A. intermedium*, Dec. and *A. neomontanum*, Willd.), is supposed to have been the plant first submitted to experiment by Störk in 1762, and is thought by some to be a variety of *A. paniculatum*. But this last species has been proved by Dr Fleming to be comparatively inert.

Aconitum Napellus is subject to a good deal of variation, whence numerous varieties and even species have been unnecessarily made. It has a tapering rootstock, with one or more lateral pyriform tubers, and erect simple stem. The leaves are divided to the petiole into five wedge-shaped lobes, which are divided into pointed linear segments. The inflorescence is a spike-like raceme with deep blue flowers. The calyx consists of 5 petaloid sepals, of which the upper one is helmet-shaped ; helmet semicircular, gradually tapering to a point. Wings hairy on the inside. Petals 5, the two upper ones converted nto short sacks, which are horizontal, supported on long stalks and concealed within the helmet; the others small, linear, sometimes wanting. Filaments of stamens hairy with cuspidate wings. Ovaries 3, when young diverging. Follicles with numerous three-sided seeds which are plicato-rugose at the back.

A. paniculatum may be distinguished by its more diffuse and spreading inflorescence, and by the more elongated helmets of its flowers.

The *A. Napellus* is cultivated at Hitchin, in Hertfordshire, and elsewhere in this country. Its roots are also imported from Germany.

The *A. decorum*, Reich., or Giant Monkshood, is cultivated at Mitcham, in Surrey, as well as several varieties of the common species. *A. ferox*, which grows on the Himalaya mountains in India, appears to contain a larger quantity of the active principle than any of the European plants. *A. heterophyllum*, another Indian species, possesses tonic properties, and is not poisonous.

Prop.—The roots of Aconite, as seen in commerce, are of a tapering form, something like those of the carrot, of a dark brown colour externally, and white internally. The name has been derived from the resemblance of its roots to the napus or *navet*, the French turnip. Sometimes the lateral tubers remain joined to the root. They are of a lighter colour, smooth, and of a fleshy texture. The taste is first bitter, then biting, and followed by tingling and numbness in the lips and tongue, which is shortly extended to the throat. These tubers form the roots or root-stocks of the following year, and are in perfection when the plant has done flowering. The leaves, flowers, seeds, &c., all have similar properties, producing, when applied to the surface or tongue, warmth, tingling, and numbness. This property is possessed by the leaves from their first appearance till the seeds begin to form; but when these are ripe, it is entirely lost. (Geiger and C.) The seeds are then intensely acrid. The leaves are officinal to prepare the extract. They are to be gathered when about one-third of the flowers are expanded. The root is to be collected in the winter or early spring, before the leaves have appeared. The leaves are used fresh, the root is dried.

Chem.—The active principle of Aconite root and leaves is the alkaloid Aconitia, the most poisonous of all known substances. It was discovered by Brandes, whose statements were corroborated by Geiger and Hesse. Mr T. Herapath has carefully analysed the root of the native *A. Napellus* for its amount of Aconitia, which he obtained by a modification of Dr Headland's process. The average product of the root, *collected after flowering*, and fresh, is 8·58 grains of Aconitia in the pound. In the same dried, 35·72 grains. But if *collected before flowering*, the yield is only 3·5 gr. per pound in the fresh, 12·13 in the dried root. These results are the average of several experiments. From French Aconite root, M. Hottot has obtained an average of 4 gr. in the pound. (*Journ. de Pharm.* April, 1864.) The root of *A. ferox* contains about 3 times as much Alkaloid as that of the English plant. (*See* below.) It should be carefully dried before being exported from India, as some roots which were packed in a damp state, and arrived mouldy, have been found to be deficient in activity. Aconite appears to contain more or less of an acrid volatile principle, the nature of which is not well understood, though it was supposed by Dr Pereira to be due to the decomposition of the Aconitia. It contains occasionally another Alkaloid which differs from Aconitia in being crystalline, and which Mr Morson has named *Napellina.* A peculiar vegetable acid, the Aconitic, was discovered in the root by Peschier. It also contains much starch, especially when gathered before flowering, at which time it is bulky and heavy, with Extractive, Albumen, a greenish Wax, Mannite, with various Vegetable acids and salts, among which is Aconitate of Lime.

Some fatal cases of poisoning have lately occurred in consequence of this root having been scraped and served up at table in the winter time in mistake for horse-radish. A pinkish colour is soon perceived at the edge of the scrapings, and the want of pungency in the taste, with the rapidly-produced tingling of the tongue, should serve as warnings.

Action. Uses.—Aconite is a powerful poison, a direct Sedative of the nerves of Sensation, and useful in Antiphlogistic treatment. When a small piece is chewed, the flow of saliva is increased, and heat and tingling, followed by numbness, are experienced. As a poison, it dilates the pupil, causes general anæsthesia and paralysis, and kills by syncope. It does not affect the brain. Useful in Neuralgia, Rheumatism, and Diseases of the Heart. (*See* Aconitia.)

Antidotes.—In cases of suspected poisoning by Aconite in any form, a considerable amount of animal charcoal mixed with water should at once be given; to be followed, after a short time, by a brisk Zinc emetic. Ammonia and Brandy may be then administered, and the patient kept in continual motion.

Dose.—Aconite leaves lose $\frac{4}{5}$ of their weight in drying, and may be prescribed in powder in doses of gr. j.–gr. ij., gradually increased; but they are uncertain.

EXTRACTUM ACONITI, B. Extract of Aconite.

Prep.—B. Take of the *fresh Leaves and Flowering Tops of Aconite* ℔cxij. Bruise in a stone mortar, and press out the juice; heat it gradually to 130°, and separate the green colouring matter by a calico filter. Heat the strained liquor to 200°, to coagulate the albumen, and again filter. Evaporate the filtrate by a water bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and, stirring the whole together assiduously, continue the evaporation at a temperature not exceeding 140°, until the extract is of a proper consistence for forming pills.

In the L. P. the expressed juice was simply evaporated. This process yields a better product. The albuminous matter, which has a tendency to ferment, is removed. The chlorophyll is retained to give the bulk and colour desired. The result is somewhat more active than the old extract, but is variable in its power, as are the leaves from which it is obtained.

Dose.—Gr. j.–gr. ij.

As the active properties of the plant are easily removed from the pulp by rectified spirit in the process of percolation, a spirituous extract (as used by the E. C.) is strongly acrid, and energetic. Its properties were ascertained by M. Lombard of Geneva, who recommended the Spirituous Tincture and Extract of the plant. A preparation called *Succus Aconiti* is much used. It is prepared by the addition of rectified spirit to the fresh juice of the leaves. An *alcoholic extract* is sometimes made by the evaporation of the tincture to dryness.

Tinctura Aconiti, B. Tincture of Aconite.

Prep.—Take of *Aconite Root*, in coarse powder, ℥ijß; *Rectified Spirit*, Oj. Macerate the Aconite Root for forty-eight hours, with ℥xv. of the Spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining ℥v. of the Spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient Rectified Spirit to make one pint.

This Tincture has one-fourth of the strength of Tinctura Aconiti, D., and one-third of the strength of Tinctura Aconiti, L. *Fleming's Tincture of Aconite* is nearly four times as strong as the B. prep.

It is beautifully transparent, of the colour of sherry wine; the taste is slightly bitter, followed by a sensation of tingling and numbness.

Dose.—♏v.–♏xv. 3 times a-day, and only to be very gradually, if at all increased.

The difference in strength of these preparations is much to be regretted. "Fleming's Tincture," which is kept in the shops and preferred by some prescribers, must on no account be given in the above doses. The stronger tincture is useful for outward exhibition, and more resembles the Liniment of the B. P., in which 20 oz. are used to make a pint, instead of 2½, as in the tincture. Each of them, moreover, varies in strength, according to the quantity of alkaloid contained in the root employed.

Linimentum Aconiti, B. Liniment of Aconite.

Prep.—Take of *Aconite Root*, in coarse powder, ℥xx.; *Camphor*, ℥j.; *Rectified Spirit*, a sufficiency. Moisten the Aconite Root with a portion of the Spirit, and macerate for seven days, then percolate into a receiver containing the Camphor, until the product amounts to Oj.

A strong preparation, for outward use. If made from a good specimen of the root, it is of great utility as a local anodyne in *tic douleureux* and other painful affections. It must not be applied where there is any sore or abrasion of the skin, nor should it be rubbed on near the mouth. It may be applied with the finger, with a sponge, or tooth-brush, till numbness is produced.

Both the juice and tincture of Aconite are occasionally given without any effect at all. On the other hand, several cases of poisoning by small quantities of the tincture have lately occurred. These different results are probably dependent upon variations in the amount of the active principle in the root used. This principle is the alkaloid Aconitia, which is the most potent preparation of the drug, and the only one which is constant in strength. But so difficult has its preparation been found, that for a long time nearly all the Aconitia sold both in England and on the Continent was inert and useless, and the London College, instead of inventing a better formula than the one which they prescribed in the L. P. of 1836, preferred altogether to omit the alkaloid, and substituted for it the tincture. The alkaloid prepared by Mr Morson was pure, but it was sold at a high price, and its mode of preparation was unknown.

The following account was published some years since by Dr Headland, of a mode of preparation successfully adopted by him in the year 1849.

> Being anxious to discover a mode by which the pure alkaloid of Aconite might be prepared in considerable quantity, and wishing to obtain such a specimen of the root as would be likely to yield it in the largest amount, I obtained from Dr Royle a sufficient quantity of the root of the *Aconitum ferox*, imported from India. On this a series of experiments was made in the Chemical Laboratory of King's College, which resulted in the adoption of the following formula of preparation as the most satisfactory and the most productive of those that were tried.
>
> Take of the root of *Aconitum ferox*, coarsely bruised, 2 pounds, and 3 gallons of *Rectified Spirit*. Boil the Aconite with a gallon of the spirit for an hour in a retort with a receiver adapted to it. Pour off the spirit. Boil the residue with another gallon, and with that which distilled over. Pour off again; and do the same a third time. Press the root, and mix the solutions. Filter. Distil off the spirit from the tincture thus obtained until this is of the consistence of thin syrup. Then pour it out of the retort, and mix with twice its bulk of *Distilled water*, and excess of *Sulphuric acid*. Filter carefully from the precipitate produced, until it is quite clear. Then again evaporate gently in a water-bath, to the consistence of syrup. Pour this syrupy liquid, which should not exceed two fluid ounces in measure, into a stoppered bottle of which it shall occupy about one-third. Add then an excess of strong solution of *Ammonia*, and shake gently. To the white mass produced add an equal bulk of pure *Ether*. Insert the stopper tightly, and, holding the bottle in a damp cloth, with a finger on the stopper, shake briskly for a few minutes. Allow then a sufficient time for the ether to rise above the water, and when it has completely separated, remove the stopper, and take up carefully the ethereal solution from the surface of the water with a pipette or common glass syringe. Pour it into an open basin. Again shake up the watery solution with another equal bulk of *Ether*, and remove this in the same manner. Do the same a third time. Let the ethereal solution evaporate spontaneously. The Aconitia is deposited.*

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* There is no doubt that the native root contains a much less and more variable quantity of the alkaloid than the Himalayan *Aconitum ferox*, so named on account of its highly poisonous properties. Even in the last the quantity is sufficiently small to be lost by a bad formula of preparation. The Indian root is thick, tap-shaped, and without rootlets; brown outside and white within. There are two different kinds, which may easily be separated by sorting. One, which I supposed to have been collected about the commencement of the Himalayan season, is heavy, of a dense horny texture, and contains a large quantity of starch. The other is light and friable, with a powdery or chalky appearance. It seems to contain the same amount of alkaloid in the same bulk as the other contains, and being of less specific gravity, is much more valuable as regards weight. I found in several experiments, the results of which were very uniform, that while from 54 to 56 grains of Aconitia could be obtained from 1 pound of the horny root, 88 to 92 grains were extracted from a pound of the friable root. The proportion is about 3 to 5.

This process is quick and certain; it is not difficult; but great care should be taken throughout, on account of the very dangerous nature of the product. The explanation is simple. It is probable that the alkaloid exists in the root in combination with Aconitic acid. This Aconitate of Aconitia is dissolved out by the spirit. When the tincture is evaporated, and a small quantity of water added, a number of resinous and other matters insoluble in water are precipitated. By the Sulphuric acid added at the same time a Sulphate of Aconitia is formed, which is probably more soluble than the natural salt. On the subsequent addition of Ammonia the Aconitia is precipitated. If there is much of the alkaloid present, the solution will become opaque and semi-solid on account of its precipitation. But the Ether which is then added dissolves entirely the precipitated alkaloid, carrying it with it to the surface of the water, and leaving behind in the latter the Sulphate of Ammonia and other substances.

The Aconitia thus prepared is transparent and vitreous in appearance, and of a very light yellow colour, like good Gum Arabic. With the exception of this tinge of colouring matter it is quite pure. If required white, it may again be dissolved in a small quantity of acid and water—precipitated by Ammonia—and extracted by Ether, as before. But some portion will be lost by so doing, and there will be no increase in the medicinal virtue of the product. It is a very potent medicine, and answers to the description given below.

The object of the several precautions and steps of the process will be best seen in a comparison with the formula of the L. P. of 1836. When the root of *A. Napellus* is used, the mode of preparation will be the same; but as the yield is less in amount, it will probably be most economical to employ the Indian root when it can be obtained.

Prep.—L. P. 1836. Take dried and bruised *Aconite root*, ℔ij., boil it with *Rectified Spirit*, Cj., in a retort with a receiver adapted to it, for one hour. Pour off the liquor, and again boil the residue with Cj. of *Rectified Spirit*, and with that recently distilled. Pour off that also. Let the same be done a third time. Press the Aconite, mix all the liquors, strain and distil. Evaporate the residue to the proper consistence of an extract. Dissolve this in *Aq.*, strain. Evaporate the liquor with a gentle heat, that it may thicken like syrup. To this add *dil. Sul'* mixed with *Aq. dest.* q. s. to dissolve the Aconitia. Drop in *Sol. Ammonia* q. s., and dissolve the Aconitia precipitated in *dil. Sul'* and *Aq.* mixed as before. Then mix in *Animal Charcoal* q. s., frequently shaking for ¼ hour. Strain again, drop in *Sol. Ammonia* q. s. to precipitate the Aconitia. Wash and dry it.

This mode of preparation proved generally, if not invariably, unsuccessful, even in skilful hands. It will be seen that the process which I have recommended above differs from this formula in several particulars, viz.:—

1. In the evaporation of the spirituous solution to a thin syrup instead of to an extract.

2. In avoiding the precipitation, filtration, and washing of the alkaloid, which is twice repeated in the other process.

3. In dispensing altogether with the use of animal charcoal.

(1.) In using more heat there would be a danger of charring or decomposing the product. But probably Aconitia is no more liable to such destructive decomposition than other alkaloids. It has been supposed that it is decomposed even by the heat of boiling Alcohol, and that this is the cause of the frequent failures in its preparation. But this is certainly not the case. I have prepared it in several other ways,—as by boiling Ether upon the root,—and by macerating it in spirit maintained for several days at a temperature of 180° Fahr. In each case the product, both chemically and medicinally, was identical with the alkaloid prepared as above. I have also boiled the latter in water for a considerable time, and found it to be unaltered.

(2.) But a most important cause of failure in the old process consisted in the large quantity of water employed, and the repeated solution of the product. For Aconitia is soluble to a considerable extent in water, 1 part being dissolved by 150 parts of the latter. I have found in the old process that even when the precipitate is well washed there remains afterwards some adherent sulphate of ammonia, by which the alkaloid is rendered deliquescent. This cannot even be removed by solution in Alcohol, so that it is necessary to wash again with water, by which a great part of it is lost. These difficulties are avoided by the Ether method. The water from which the alkaloid is precipitated should be very small in amount, so that on the addition of Ammonia the solution becomes semi-solid. It would not be possible to lose much by solution in this amount of water. But supposing it to be only 4 ounces, it would dissolve at least 12 grains of Aconitia. If the *A. Napellus* were used, this would sometimes be the whole quantity. I have found that the Ether not only dissolves the alkaloid precipitated, but also the greater part of that which remains dissolved. So that after the third Ether-washing the water retains scarce any active or poisonous properties. As Sulphate of Ammonia is perfectly insoluble in Ether, the alkaloid is obtained quite dry in this way.

(3.) Had any Aconitia been forthcoming by the old process, which was highly improbable, and very rarely, if ever, proved to be the case, it was next to be decolorised by the use of Animal Charcoal. This substance has not only an attraction for colouring matters, but exhibits also a remarkable affinity for vegetable alkaloids, abstracting them from the solutions in which they are contained. This I believe to be particularly the case with Aconitia; and it is a serious cause of loss in the preparation of an alkaloid which is obtained in such small quantities as this is. If 10 grains of the coloured alkaloid be dissolved in water acidulated with Sulphuric acid, and mixed with Animal Charcoal sufficient to decolorise it, and if, after standing and filtration, the liquid be concentrated, and Ammonia added in excess, the product will be found to be very much reduced in amount. In more than one experiment I have found that there is none left at all.

So that the causes of failure in the old process are—the large amount of water employed in the process of precipitation and subsequent washing—the use of Animal Charcoal in decolorisation—and perhaps also, the heat necessary to reduce the spirituous solution to an extract.

Properties.—Aconitia, prepared as above, is, when perfectly purified, white and inodorous. If dried after precipitation from water, it is chalky and friable; when obtained by the evaporation of its alcoholic or ethereal solution, it is transparent and horny. I have not been able to obtain it in crystals of any kind whatever. It is soluble in 150 parts of water; very soluble in alcohol, and still more so in ether. The solution has a bitter and somewhat sweetish taste, which is followed by heat, tingling, and numbness of the tongue. It has a faintly alkaline reaction. The alkaloid is not a powerful base, but with the mineral and vegetable acids it readily forms salts, which are also amorphous, much more soluble in water than itself, and possess similar properties. The solution of one of these salts gives a white precipitate with a solution of Bichloride of Platinum, a yellowish one with Terchloride of Gold, and yellowish-brown with free Iodine. Aconitia, when strongly heated, is decomposed, evolving free Ammonia, and at length entirely dispelled.

Mr Phillips supposed that the Aconitia generally obtained is mixed with another less active or inert principle, which he called Anemonin, and which differs from it in being more soluble in water. This does not appear to be the case with the alkaloid which I have prepared. I prepared some by precipitation, filtration, and washing with water. This, being brought in contact with a large quantity of water, ought, if the above view were correct, to contain more of the insoluble part, and thus be stronger and more active than that obtained by the Ether-process. But I found on experiment that, as nearly as could be judged, the very same amount of each was required, whether to poison an animal or to produce an effect on the skin.

The process now published in the B. P. resembles Dr Headland's formula in the use of Ether, but differs from it in the important point of not prescribing the exact amount of water to be used in dissolving the sulphate. If much water is used, the quantity of the alkaloid obtained will be infinitesimal.

Aconitia, B. Aconitia ; also called *Aconitina* and *Aconita*.

Prep.—B. Take of *Aconite Root*, in coarse powder, ℔xiv.; *Rectified Spirit*, *Distilled water*, *Solution of Ammonia*, *Pure Ether*, and *Dilute Sulphuric acid*, of each a sufficiency. Pour upon the Aconite Root Ciij. of the Spirit, mix them well, and heat until ebullition commences; then cool and macerate for four days. Transfer the whole to a displacement apparatus, and percolate, adding more Spirit, when requisite, until the root is exhausted. Distil off the greater part of the spirit from the tincture, and evaporate the remainder over a water bath until the whole of the alcohol has been dissipated. Mix the residual extract thoroughly with twice its weight of boiling Distilled water, and, when it has cooled to the temperature of the atmosphere, filter through paper. To the filtered liquid add Solution of Ammonia in slight excess, and heat them gently over a water bath. Separate the precipitate on a filter, and dry it. Reduce this to coarse powder, and macerate it in successive portions of the Ether with frequent agitation. Decant the several products, mix, and distil off the ether until the extract is dry. Dissolve the dry extract in warm Distilled water, acidulated with the Sulphuric acid; and, when the solution is cold, precipitate it by the cautious addition of Solution of Ammonia diluted with four times its bulk of Distilled water. Wash the precipitate on a filter with a small quantity of cold Distilled water, and dry it by slight pressure between folds of filtering paper.

A spirituous extract of the root is first obtained, free from starch and other vegetable matters, insoluble in Rectified Spirit. Resinous matters are separated by solution in water and filtration. The water then contains the Aconitate, or natural salt of Aconitia. Ammonia is added, which combines with the Aconitic acid, and as the quantity of water used this time was only twice the weight of the extract, most of the Aconitia is precipitated. The precipitate is dried. Any ammoniacal salt adherent is separated by acting on it with Ether, which also leaves behind certain other impurities. The ethereal extract, which is nearly pure Aconitia, will be diminished in quantity, if not altogether lost, in the concluding part of the process. It is dissolved in *warm* water acidulated with $S\,O_3$, the quantity of water not stated. Now, supposing the dry root to contain as much as 20 grains of the alkaloid in the pound, 14 pounds ought to yield 280 grains. This amount is soluble in 50 parts of hot water, so that 1½ pint (or 4½ pints cold) will dissolve the whole of it, and the addition of Ammonia to that quantity of solution will produce no result whatever. When the root is poor in alkaloid, as often happens, a much smaller quantity of water will retain the Aconitia. In any case the loss is great, unless the water is used on a limited scale.

The formula of Aconitia is doubtful. The B. P. (1864) gave the formula ($C_{60}H_{47}N\,O_{14}$). It states that it is "a white, usually amorphous solid, strongly alkaline to reddened litmus, neutralising acids, and precipitated from them by the caustic alkalies, but not by Carb. Ammonia, or the Bicarbonates of Potash or Soda. It melts with heat, and burns with a smoky flame. When rubbed on the skin it causes tingling, followed by prolonged numbness. It is a very active poison."

Tests.—Should dissolve entirely in pure ether, and leave no residue when burned. The only certain means of recognising it is by its very characteristic physiological action.

Action. Uses.—Aconitia possesses the properties of Aconite root in a high degree. It is mainly employed in medicine for the numbing effect which it produces on the superficial nerves. By this it is rendered highly useful as a remedy for Neuralgia, particularly Tic douloureux of the face, in which case a preparation of the alkaloid rarely fails to afford relief. Very small doses have been given internally with advantage in the case of acute Rheumatism, as a sedative. Larger doses are very poisonous. From the effects produced on animals, Dr Headland calculates that $\frac{1}{10}$th of a grain would be certainly fatal to an adult man.*

UNGUENTUM ACONITIÆ, B. Ointment of Aconitia.

Prep.—Take *Aconitia*, gr. viij., dissolve in *Rectified Spirit*, ʒß, add *Prepared Lard*, ℥j. Mix thoroughly.

This is four times as strong as the ointment recommended by Dr Headland, and twice as strong as his stronger ointment. The use of spirit is unnecessary.

In the ointment of Aconitia, Dr Fleming used 16 grs., while Dr Turnbull and Mr Phillips recommended 8, and Dr Headland 2, to the ounce of lard.

Dr Headland has also recommended the two following preparations:—

LIQUOR ACONITIÆ.

Prep.—Dissolve *Aconitia* gr. j. in *Rectified Spirit* fʒj. Add *Distilled water* fʒix. Each fluid drachm contains 1-10th of a grain, and each drop 1-600th.

LOTIO ACONITIÆ.

Prep.—To *Liquor Aconitiæ*, fʒx. add *Glycerine*, fʒij. When the alkaloid is pure, and prepared as above, these proportions should be adhered to.

A small quantity of the Ointment, or fʒß of the Lotion, rubbed on to the side of the face in a case of Neuralgia, soon produces numbness, lasting for several hours or a whole day. The *Liquor Aconitiæ* is intended for internal use, and is much more certain and exact than the usual preparations of Aconite. In cases of acute Rheumatism or heart-disease, ♏v.–♏xij. (*i. e.* 1-120th to 1-50th gr. Aconitia) may be given at a dose.

PODOPHYLLI RADIX, B. Podophyllum peltatum, *Linn.* The Root, dried. May Apple. American Mandrake.

This purgative root (or rhizome) was imported into the B. P. from the American Pharmacopœia. The plant is almost universal in the Northern and Southern States. Growing in shady places and marshy ground, it spreads rapidly by means of its creeping root-stock. The fruit is known as *Wild Lemon.* It is sub-acid and agreeable in flavour, and is eaten with impunity. The medicinal quality resides in the rhizome and rootlets. The May Apple was used as a medicine by the Indian aborigines. It was included in the list of Materia Medica of the first U. S. P., published in 1820. Its resinous extract, called Podophyllin, is in such extensive demand that in one year 40,000 oz. were prepared in Cincinnati in Ohio. Decandolle makes the genus into a separate order, *Podophyllaceæ;* Mr Darby places it with the *Berberideæ.* In spite of its vulgar names, it has no affinity with the Apple, the Lemon, or the

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* "Essay on the Action of Medicines," Chap. IV., *Art.* Aconite.

Mandrake. Like the latter, however, its leaves are reported to possess narcotic properties. It is generally classed with the plants of the Nat. Ord. *Ranunculaceæ.*

PODOPHYLLUM. (Generic characters.)—Sepals 3, caducous; petals obovate, 6-9; stamens 16-18; anthers linear; stigma large, sessile; capsule indehiscent, fleshy. Seeds numerous, on a lateral placenta.

PODOPHYLLUM PELTATUM, *Linn.*—Rhizome horizontal, creeping, some feet in length; perennial; stem simple, 12-15 inches high, terminating in 2 leaves and one flower; leaves peltate, 5-7 parted; lobes toothed or cleft at the apex; flowers arising singly between the leaves, large, nodding, white; fruit about the size of an egg, oval, crowned by the persistent stigma. When ripe it is yellow, one-celled, with 12 seeds, and a sweetish acid pulp.

Podophyllum root, as imported, is in pieces of variable length, generally 1–6 inches. In thickness it measures from 2–4 lines, being generally of the size of a common goose-quill. It is wrinkled, and marked with knots from which the stems arise. In colour externally reddish-brown, internally whitish. It breaks with a short fracture: pale brown slender rootlets are given off at intervals, or mixed with the thicker rhizome. The powder is yellowish in colour, has a peculiar (sweetish) odour, and a bitterish subacrid and nauseous taste.

Chem. Char.—Podophyllum contains a bitter crystalline principle, two amorphous resinous principles, with gum, starch, albumen, lignin, gallic acid, some fixed and volatile oil. The bitter principle was obtained by Mr Hodgson, of Philadelphia, by boiling the root with quicklime and water, precipitating the strained decoction with Sulph. Zinc, dissolving the residue in alcohol, and again in boiling water, from which last it precipitates on cooling. It is found to possess none of the purgative property of the drug. This resides in the resins, which are insoluble in pure water, but soluble in an alkaline solution. One, which is in greater quantity, is soluble in rect. spirit and in ether. The other is soluble in rect. spirit, but insoluble in ether. The first is supposed to be more active than the other, and Mr Allen ascribes to it the whole purgative property of the drug. An infusion of Podophyllum has a slight acid reaction, causes white precipitates with solutions of Lead, Baryta, Tartar Emetic, and Gelatine; blackens solutions of persalts of Iron (gallic acid), and strikes a deep violet with Iodine (starch). No change is produced by acids in the simple infusion. From an alkaline infusion they precipitate the resins of Podophyllum.

Action. Uses.—Podophyllum has a purgative action resembling that of Jalap. An extract made with rectified spirit is very active, but the Resin of Podophyllum is a more convenient preparation.

Dose of the powdered root, gr. x.–gr. xx.

PODOPHYLLI RESINA, B. Resin of Podophyllum. *Podophylline.*

This is made by precipitating with acidulated water a tincture of the root made with rectified spirit. Water alone would cause this precipitation, but the addition of acid, in which the resin is very insoluble, separates it more completely. The acid likewise causes the precipitation of *Berberine*, which is also contained in American "Podophyllin."

Prep.—B. Exhaust *Podophyllum* in coarse powder ℔j. with *Rectified Spirit* Oiij. or q. s., by percolation; place the tincture in a still, and draw off the spirit. Acidulate *Dist. water* q. s. with one twenty-fourth of its bulk of *Hydrochloric acid*, and slowly pour the liquid which remains after the distillation of the tincture into three times its volume of the acidulated water, constantly stirring. Allow the mixture to stand for twenty-four hours to deposit the resin. Wash the resin on a filter with Distilled water, and dry it in a stove.

An impure resin, or mixture of resins, in the proportion of 3–4 per cent. of the root, is obtained in this way as a pale greenish-brown amorphous powder, soluble in rect. spirit and in ammonia, precipitated from the first solution by water, from the other by acids. The B. P. states that it is "almost entirely soluble in pure ether." One of the resins of Podophyllum, constituting sometimes ⅓ to ¼ of the whole, is, however, insoluble in this reagent. According to Dr Manlius Smith, the resin, when pure, is white, and purges actively in doses of 2–3 grains.

Action. Uses.—According to Wood and Bache, it is an active and certain cathartic, producing copious liquid discharges without much griping, or other unpleasant effect. It has been found so useful in hepatic complaints that in America the resin has earned the title of "Vegetable Calomel." As an ordinary purgative it may be given alone, or with blue pill, calomel, rhubarb, jalap, or cream of tartar. It is very useful in inflammatory complaints when purging is required. Also in Gout, Rheumatism, Hepatic Congestion, Dropsy.

Dose.—Gr. ß–gr. ij. or more.

Many other plants of this order are used as medicines in different countries where they grow. The roots of *Actæa racemosa* in North America, and *A. cimicifuga* in Siberia, contain an acrid principle, and are employed as expectorants and diaphoretics. The first resembles Black Hellebore, for which it has been substituted in commerce. It is much recommended in rheumatic complaints, a tincture (one part to four of proof spirit) being given in doses of ʒß–ʒij.

The root of *Hydrastis canadensis*, the Yellow Puccoon of Canada and North-west America, has been employed by the Indians from early times, and is much extolled by American practitioners as a tonic in intermittents and convalescence from acute disorders. Mr Perrins finds that this root contains *Berberine* and a peculiar alkaloid, *Hydrastia*, which is a powerful base. (P. J. Series ii. vol. iii. p. 546.)

Xanthorhiza apiifolia, "American Yellow-root," is a pure bitter tonic, much used in America. Mr Perrins has discovered *Berberine* in this root. A yellow dye is also prepared from it. It may be used in the same cases as Calumba and Quassia.

MAGNOLIACEÆ, *Dec.* Magnoliads.

The species occur in a scattered manner in America, China, Japan, New Holland, and New Zealand. Many of these are remarkable for their aromatic properties, in consequence of the secretion of a volatile oil. The *Star-Anise*, a fruit so called from being arranged in a stellate manner, and having the taste and odour of Anise, is well known in the East by the name of *Badian*. This name, having been introduced into Europe, has given origin to the term Badianifera. Star-Anise is the fruit of *Illicium anisatum*, a native of China, or, according to Siebold and Zucc. of *I. religiosum*, which may be only a variety of the former.

DRIMYS WINTERI, *Dec.* Cortex. Winter's Park. *Polyandria Tetragynia*, Linn.

Winter's Bark is the produce of the Drimys Winteri (fig. 36), and was first brought to Europe by Captain Winter, after a voyage to the Straits of Magellan in 1579. On account of its aromatic and stimulant properties it has been used as a substitute for Cinnamon. Being also tonic, it resembles Canella bark. It is now seldom employed.

Fig. 36.

MENISPERMACEÆ, *Dec.* Moonworts.

The Menispermaceæ, being anomalous in some characters, are considered by Dr Lindley as more closely allied to Smilaceæ among Endogens. The plants f this family are confined chiefly within the tropics, both of Asia and of America; a few straggle beyond those limits, and some are found on the coasts f Africa.

Prop.—The Menispermaceæ secrete a bitter principle along with a large proortion of Starch both in their roots and stems. Many of them are internally f a yellow colour; an acrid principle is occasionally found, especially in the ruits of some species. Hence some are useful as Tonics and Demulcent iuretics. *Cocculus indicus* is poisonous.

AREIRÆ RADIX, B. The dried root. Cissampelos Pareira, *Linn.* Velvet leaf. *Diœcia Monadelphia*, Linn.

Pareira is the root of a climbing plant, indigenous in Brazil, called *areira brava*, or Wild Vine, and Velvet Leaf in some of the West dia islands. It was first made known by Marcgraf and Piso in their orks, Hist. Nat. and Hist. Rer. Nat. 1648, by the name of Caapeba; e Portuguese called it Erva de nossa Senhora, and Ray mentions in 1688, as "contra calculum excellentissima est." The root, and o the stem, not only of this, but of other species, are employed.

Aublet states, that the roots of *Abuta rufescens* pass for and are employed as White Pareira in Cayenne, and that Red Pareira is yielded by a variety of the same. Auguste St Hilaire gives *Cissampelos glaberrima* as yielding the original Pareira of Brazil, where Martius states it is called Capeba and Sipo de Cobras.

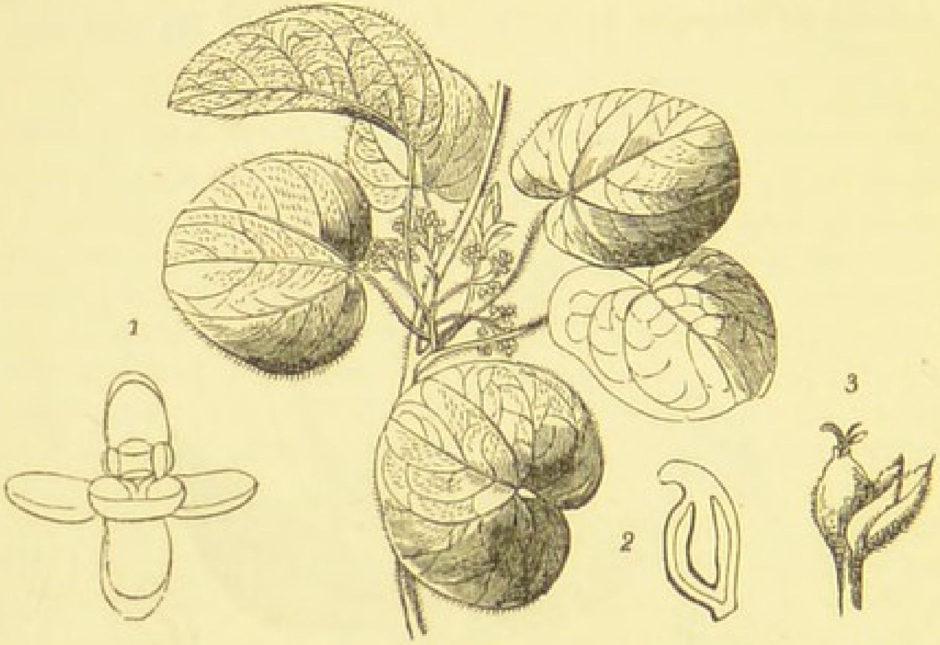

Fig. 37.

Cissampelos Pareira (figs. 37 and 38), like others of the genus, is diœcious with round and smooth, or downy, twining stem. Leaves roundish, peltate subcordate, aristate, smooth above, the under surface covered with silky pubescence. Flowers small, racemose (fig. 37). Racemes branched, with small

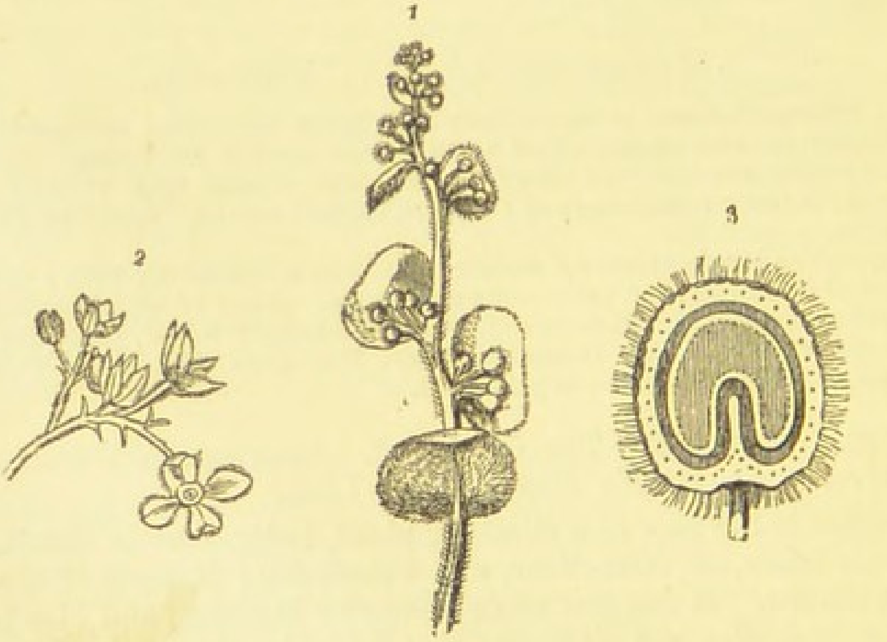

Fig. 38.

bracts. Peduncles solitary, or in pairs, flowers hispid (fig. 37, 1, fig. 38, 2). Sepals 4. Petals, 4, united into a cup-shaped corolla. Stamens monadelphous with the 2 two-celled anthers opening horizontally at the top (fig. 38, 1). Racemes simple, with broad foliaceous bracts. Calyx, of one lateral sepal, with one petal in front of it (fig. 37, 3). Ovary solitary. Stigmas 3. Drupe hispid, scarlet, obliquely reniform, not compressed, wrinkled round its margin. Seed solitary uncinate. Embryo (fig. 37, 2 and 38, 3) long, roundish, enclosed in a fleshy albumen.

Pareira Root is found in commerce in pieces varying from a few inches to a foot in length, of different thicknesses, tortuous, more or less cylindrical, of a dark brown colour, furrowed longitudinally, exhibiting on the transverse section a number of concentric rings (but which are sometimes very *eccentric*), and rays radiating from the organic centre. The root is without odour, and the taste is sweetish, with some aroma, and afterwards bitter. Some of the kinds found in shops are without any sweetness. It is imported from Brazil.

Chem.—It contains resin, a yellow bitter principle, a brown-coloured matter, vegetable mucus, starch, nitrate of potash, with some other salts. (*Feneulle.*) Wiggers has announced a peculiar vegetable alkali, of a sweetish-bitter taste, which he has called *Cissampeline.* The active and useful properties seem to depend on the Bitter principle, Starch, and Nitrate of Potash.

Dose and Adm.—In powder, gr. xx.–gr. xl. The infusion was long employed. The use of the decoction was first advised by Sir B. Brodie. Dr Christison recommends "a solution obtained with cold water by percolation, as in the Edinburgh formula for obtaining the extract; because the product, as it does not contain the starch of the root, is less apt to decay." Pareira is employed by surgeons in catarrh of the bladder.

DECOCTUM PAREIRÆ, B. Decoction of Pareira.

Prep.—Take *Pareira Root sliced* ℥jß., and *Distilled water* Oj. Boil for fifteen minutes and strain. Add *Dist. water* till the product measures Oj.

Dose.—f℥j–f℥iij.

Action. Uses.—Mild tonic and demulcent diuretic.

EXTRACTUM PAREIRÆ, B. Extract of Pareira.

Prep.—Take of *Pareira Root* in coarse powder, ℔j.; *Boiling Dist. water*, Cj. or a sufficiency. Digest the Pareira with Oj. of the water for twenty-four hours, then pack in a percolator, and adding more of the water, allow the liquor slowly to pass until Cj. has been collected, or the Pareira is exhausted. Evaporate the liquor by a water bath until the extract has acquired a suitable consistence for forming pills.

Restored from the L. P.

Dose.—Gr. x.–gr. xx.

EXTRACTUM PAREIRÆ LIQUIDUM, B. Liquid Extract of Pareira.

Prep.—Macerate *Pareira* in coarse powder ℔j. in Oj. of *Boiling Dist. water* for twenty-four hours, then pack in a percolator, and add *Boiling Dist. water*, until the Pareira is exhausted, or Cj. has been collected. Evaporate the liquor by a water bath to f℥xiij., and when it is cold, add *Rectified Spirit* ℥iij., and filter through paper.

Each ℥j. of this extract corresponds to ʒj. of the root.
Dose.—ʒß–℥ß.

Calumbæ Radix, B. The root, sliced and dried. Cocculus palmatus, *Dec.* The Calumba plant. *Calumbo. Diœcia Hexandria*, Linn.

Calumba Root was first made known as a medicine by F. Redi about 1677. Semedus mentioned it before 1722 among medicines from India. In works on Materia Medica in use in India, it occurs by the name of *Kalumb.* Dr Berry first ascertained that it was the root of a plant (of which he figured the male) inhabiting the forests on the coast of Mozambique and Oibo in Eastern Africa, but where it is never cultivated. Sir W. Hooker in 1830 described and figured both male and female plants, from plants introduced by Captain Owen into the Isle of France. Figs. 39 and 40.

The Calumba plant has a perennial root with several spindle-shaped fleshy tubers (7), filled with longitudinal fibres of vessels, which are externally brown, with transverse warts, and internally of a deep yellow colour, devoid of smell, but very bitter. The stems are annual, herbaceous and twining, covered with glandular hair, hairy below. Leaves alternate, nearly orbicular, cordate at the base, 5–7 lobed, lobes entire, wavy on the surface and margin, acuminate, hairy with long petioles. Racemes axillary. Flowers small, diœcious, green. Calyx of 6 sepals in two series with bracteoles. Petals 6, (1, 2) obovate, half enclosing the 6 opposite stamens. Anthers terminal, 2-celled, dehiscing vertically. Ovaries 3 (3) united at the base. Drupes (4) or berries about the size of a hazel-nut, densely clothed with long-spreading hairs, tipped with a black oblong gland. Seeds (5, 6.)—Bot. Mag. t. 2970-71.

Calumba, in its officinal form, consists of tranverse sections (8) of the root and its lateral tubers, which are flat, circular, about ¼ to ½ an inch in thickness, and from ½ to 2 or 3 inches in diameter. The cortical portion is 2 or 3 lines in thickness, covered externally with a

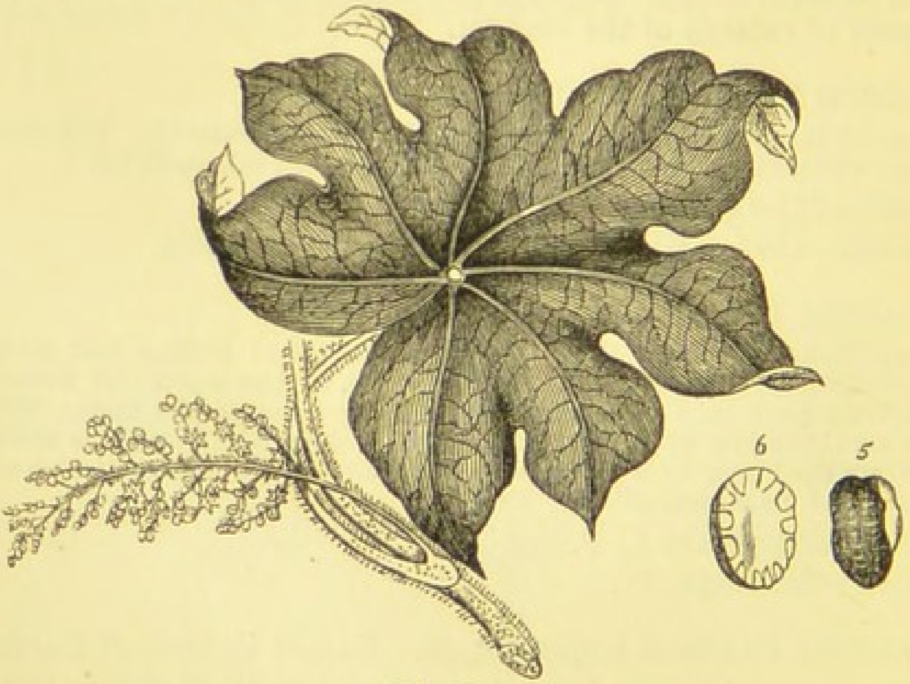

Fig. 39.

brownish-coloured cuticle; the faces are of a greyish-yellow colour: the interior portion in concentric rings, easily distinguishable from the cortical, is soft, almost spongy, thinner towards the centre from shrinking there. The root is brittle, and therefore easily pulverised; the powder of a greenish-yellow tinge; its taste is bitter and mucilaginous, with a slightly aromatic odour. G. and K. ii. tab. v. fig. 5.

Chem.—Calumba root consists of one third of starch, a yellow-coloured bitter substance (*Calumbine*), another neutral principle called *Berberine* (because obtained also from the Berberry), *Calumbic acid*, mucoid matter (Planche), resinous extractive (Buchner), a trace of volatile oil, &c. Calumbine was first obtained pure by Wittstock. When pure, it is colourless, but intensely bitter; it crystallises in rhomboidal prisms, melts like wax; it is little soluble in water, but is dissolved by Alcohol or Ether, and by acids as well as alkalies, Acetic acid being the best solvent. Its composition is said to be $C_{42} H_{22} O_{14}$.

Calumba, when good, breaks easily, and, from the abundance of starch, gives a dark-blue colour with tincture of Iodine. Neither Sesquichloride nor Sulph. of Iron produce any change, as it contains no Tannin; neither do Emetic Tartar or Gelatine, showing absence of Gallic acid. Infusion of Galls gives a greyish precipitate. (*p.*) "The decoction, when cold, is blackened by solution of Iodine." (B.)

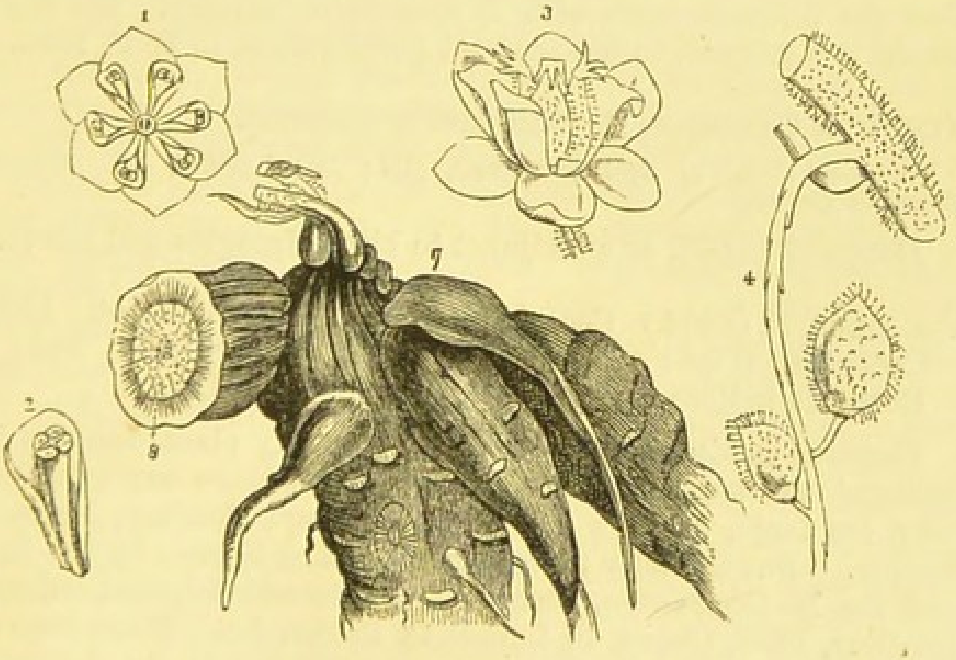

Fig. 40.

Calumba root is sometimes adulterated with American or False Calumba, of which the infusion becomes dark green with the Sesquichloride of Iron; also with Bryony root, which is distinguished by a permanent bitterness of taste with acridity. A considerable quantity of an article called *Calumba wood* was imported from Ceylon about two years since. It displays the peculiar structure of a Menispermaceous stem. The true Calumba plant does not grow in Ceylon; and it appears that this wood is the product of the *Menispermum fenestratum*, Gærtn., *Coscinium* of Colebrook, said by Ainslie to be in common use as a tonic among the Cingalese. It contains the alkaloid Berberina.

Action. Uses.—Stomachic and mild Tonic, in powder, gr. x.–gr. xxx. twice or thrice a-day.

Extractum Calumbæ, B. Extract of Calumba.

Prep.—Take of *Calumba Root* cut small, ℔j.; *Distilled water*, Oiv. Macerate the Calumba with two pints of the water for twelve hours, strain and press. Macerate again with the same quantity of water, strain and press as before. Mix and filter the liquors, and evaporate them by the heat of a water bath until the extract is of a suitable consistence for forming pills. (Made with Proof Spirit in B. P. 1864).

Dose.—Gr. v.–gr. x.

Infusum Calumbæ, B. Infusion of Calumba.

Prep.—B. Macerate *Calumba* cut small ℥ß in *Cold Distilled water* ℥x. for one hour in a covered vessel, and strain.

Dose.—f℥jß twice or thrice a-day. It soon undergoes decomposition. If made with hot water, it contains an abundance of Starch, and when prescribed with Iodine, forms a dark-blue mixture. But cold water takes up albumen, which is coagulated by hot water, so that the infusion made with it soon turns mouldy. Mr Redwood thinks it a mistake to use the root powdered, as in B. P. 1864.

Tinctura Calumbæ, B. Tincture of Calumba.

Prep.—B. *Calumba Root* cut small, ℥ijß; *Proof Spirit*, Oj. Prepare as *Tinctura Aconiti.*

Dose.—fʒj.–fʒij. as an adjunct to bitter draughts and mixtures.

Cocculus, B. (1864.) Cocculus indicus. The Fruit dried. Anamirta Cocculus, *Wight and Arnott.* (Cocculus suberosus, *Dec.*) The Cocculus indicus plant. *Diœcia Monadelph*, Linn.

Cocculus indicus is the fruit of a climbing plant common in the mountainous parts of the Malabar coast, whence our supplies, and they are large, are now all derived through Bombay, Madras, and Ceylon. But formerly these berries reached Europe by the Red Sea and the Mediterranean, whence they were called Grana Orientis by Ruellius, 1536, Coque du Levant by Pomet, &c. There is no proof, though it is probable, that they were known to the Arabs. The Mahizuhra (Fish-poison) of Rhases, Serapion, and Avicenna, and referred by Sprengel to these berries, seems to have been a plant and its bark, "qua juvat in doloribus juncturatarum et contortione digitorum." (Serapion.) Plempius coined the name *Ichthyoctonum*, to indicate "fish-poison." The plant yielding these berries was ascertained by Dr Roxburgh. It was named *Anamirta paniculata* by Colebrook, and subsequently *A. Cocculus* by Wight and Arnott; the latter name was adopted by the Edinburgh Pharmacopœia. It was the *Menispermum Cocculus* of Linnæus. The name Cocculus is probably derived from the Tamul *Kakacollie*, which signifies *crow-killing*, as does the Sanscrit *kakmare.*

The Cocculus plant is a powerful climber, with ash-coloured, deeply cracked, corky bark, whence the plant was called *Cocculus suberosus.* The leaves are stalked, large, broad-ovate, or rather roundish, truncated or somewhat cordate at the base, acute at the apex, firm in texture, soft and drowny when young, with 5 digitate ribs, petioles a little shorter than the leaves, tumid at both ends. Flowers diœcious, in lateral compound racemes. Calyx of 6 sepals in a double series with 2 close-pressed bracteoles. Corolla none. ♂ Stamens united into a central column dilated at the apex: anthers numerous, covering the whole globose apex of the column. ♀ Flowers unknown. Drupes 1–3, 1-celled, 1-seeded. Seed globose, deeply excavated at the hilum. Albumen fleshy; cotyledons very thin, diverging, and each occupying a side of the hollow cavity that contains the embryo.

Cocculus berries were described by Dale as being kidney-shaped and something like bay-berries, but smaller. They are ovate or nearly round, somewhat larger than a pea, blackish-brown, and wrinkled externally, with the outer coat thin and dry, and within it a white, woody, bivalvular shell, enclosing the whitish, semilunar, oily, and very bitter tasted seed; which never fills the whole of the cavity, which, in old seeds, is sometimes entirely empty. The seeds should fill at least two thirds of the shell.

Chem.—The kernels of *Cocculus indicus* were analysed by Boullay; but most recently by Couerbe and Pelletier, who obtained *Picrotoxine*, Resin, Gum, Fatty acid, and a Waxy matter, Malic acid, Mucus, Starch, and Salts. In the shell they obtained two alkaloids, but in a small quantity, which they called Menispermia and Paramenispermia. But the nucleus being the part used, it is necessary to notice only its active principle. *Picrotoxine* is colourless, crystallises in needles, sometimes in silky filaments, in plates, and in rhombic prisms. (*c.*) Its taste is intensely bitter. It is soluble in 150 parts of water at 57° F., and in 25 of boiling water, in 2 of Ether, and in about 3 parts of Alcohol. It is insoluble in both the fixed and the volatile oils. It does not combine with acids, though soluble in Acetic acid, and as it forms combinations with alkalies, it is considered by some to be of the nature of an acid. It consists of $C_{10}H_6O_4$. To obtain it, Dr Christison recommends to separate the oil first from the kernels by expression, next to exhaust the residuum by percolation with rectified Spirit, which is then to be distilled off. The residue is agitated with boiling water and a little $H\,Cl$. The dissolved Picrotoxine may be obtained, on the water cooling after moderate concentration.

Action. Uses.—Poisonous; used for taking fish and game, and employed by unprincipled brewers for adulterating porter, being unblushingly recommended by Childe and by Maurice in their books "on Brewing." It is used chiefly in the form of a bitter extract, known by the name of B. E., *black extract*, which is ostensibly prepared for tanners. (*See* Cycl. of Pract. Receipts.) It produces giddiness, tetanic convulsions, and coma; applied externally in powder, it destroys vermin, and is useful in scabies, ringworm, and porrigo.

Unguentum Cocculi, B. (1864.) Ointment of Cocculus indicus.

Beat well in a mortar *Seeds of Cocculus indicus*, gr. lxxx., and rub with *Prepared Lard* ℥j. Used to destroy pediculi, and as a stimulant in some skin diseases.

An ointment of Picrotoxine may be formed in the proportion of *Picrotoxine* gr. x. to *Lard* ℥j.

Papaveraceæ, *Jussieu*. Poppy-worts.

Papaveraceæ inhabit the temperate parts of the northern hemisphere; a few are found in tropical Asia, Australasia, Cape of Good Hope, and equinoctial America. The milky juice of most of the species is acrid and narcotic.

Papaver, *Linn.* *Polyand. Monogynia*, Linn.

Herbaceous plants with a white juice. Peduncles 1-flowered, naked, drooping before the expansion of the flower. Sepals 2, convex, deciduous. Petals 4, (fig. 41.) Stamens numerous, (41, 1.) Style wanting. Stigmas 4 to 20, radiating, sessile upon the disk which crowns the ovary. Capsule obovate, 1-celled, composed of 4 to 20 carpels united together, and opening by small valves beneath the crown formed by the stigmas. Placentæ opposite the stigmas, produced internally into spurious, incomplete dissepiments. Seeds numerous, reniform (fig. 41, 3, 4.)

Rhœados Petala, B. Papaver Rhœas, *Linn.* The Petals. Corn Poppy. Red Poppy.

The common Red, or Corn-Poppy, is found in corn-fields and on roadsides throughout Europe, and has probably been introduced with wheat. This species, or *P. dubium*, with its oblong capsules, is probably the ῥοίας of the Greeks. The root is fibrous, the stem many-flowered, and, like the peduncles, hispid with spreading hairs. Leaves pinnate or bipinnate, with oblong, lanceolate, jagged, toothed lobes. Petals a bright scarlet, often nearly black at the base. The filaments subulate. Capsule obovate, rounded at the base, smooth, with the margin of the 8 to 10 stigmas incumbent. The flowers expand in June and July.—E. B. 645.

The scarlet petals of this Poppy, which are officinal on account of their colour, become of a dull red colour on drying, and lose the somewhat heavy opium-like odour of the fresh flowers. "They should be dried quickly with the aid of a gentle heat and a current of air." They impart their colour to water, which is preserved in the form of the Syrup. This is supposed to have some slight narcotic properties, but is probably useful only as a colouring ingredient. This colour is blackened by alkalies, and rendered of a dark violet or brown tinge by Sesquichloride of Iron. The petals consist of yellow Fatty matter 12, red Colouring matter 40, Gum 20, Lignin 28, in 100 parts. (Riffard, as quoted by Dr Pereira.)

Syrupus Rhœados, B. Syrup of Red Poppy.

Prep.—B. *Red Corn-poppy petals*, ℥xiij.; *Aq.*, Oj.; *Sugar*, 2¼ pounds. Add the petals gradually to the water, heated in a water bath, frequently stirring them;

then the vessel being removed, macerate for twelve hours, afterwards press out the liquor, strain, add the sugar, and dissolve by means of heat. When nearly cold, add the spirit and make up for the loss with Dist. water, so that the product shall weigh ℔iij. ℥x., and have a Sp. Gr. 1·330. Used for colouring mixtures.

PAPAVERIS CAPSULÆ, B. Papaver somniferum, *Linn.* The Garden or White Poppy. Capsules, ripe, dried, and deprived of the seeds. Poppy-heads.

The capsules of the above plant are officinal, as well as the inspissated juice, or Opium, obtained from them. It appears to have been one of the early cultivated plants, as Homer is thought to allude to it as growing in gardens. Hippocrates mentions two kinds, the *black* and *white poppy*, so the Arabs and Persians distinguish the *khuskhash abiuz* or white, from the *khuskhash aswad*, or black poppy. The white poppy is now cultivated in the plains of India, and the black, or rather deep-red variety, in the Himalayan mountains.* It was early cultivated, as it still is, in Egypt, also in India, Persia, Asia Minor, as well as in some parts of Europe.

The Garden Poppy (fig. 41) is probably a native of Persia. It has, however, been so long grown in gardens in various parts, that it is sometimes found apparently wild, especially in the southern parts of Europe.

The plants are from 2–4 feet high, the stems are round and straight, glaucous, smooth, with a few hairs towards the white and tapering extremity and on the peduncles. The leaves are large, sessile, amplexicaul, smooth, of a glaucous green, margins wavy, cut and toothed. The flowers are large and terminal, drooping before flowering, with smooth concave sepals; 4 large petals, roundish in form, white or of a purplish colour with a darker-coloured spot near the claws. The capsule is oval, or nearly globose, large, smooth, with parietal placentæ equal in number to the stigmas, which are covered with numerous white or brownish coloured, kidney-shaped seeds. Flowers in June and July, and the capsules ripen about two months later.—E. B. 2145.

Some consider that there are two distinct species instead of varieties of this plant. *P. officinale* (Gmelin) var. *album* is larger and less glaucous, with white petals and seeds, capsules ovate-globose, and remaining closed under the crown of stigmas (fig. 41, 1), while *P. somniferum* (Gm.) var. *nigrum* has the flowers violet or red, seeds black, capsules globose, opening by foramina under the stigmas (fig. 41, 2).

CAPSULÆ PAPAVERIS.—"Globular, 2–3 inches in diameter, crowned by a sessile stellate stigma." (B.) Poppy-heads are to be collected before they are quite ripe, as in this state they contain more of the narcotic principle. The French find those from the Levant or the southern provinces of France to be more powerful than those grown in the north. The seeds (*maw* seeds) ripen notwithstanding the

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* Mr Hamilton says, "The opium is chiefly obtained from the single white poppy; I have also seen the red and purple colours, though only one is usually seen in a field. I hardly remember to have noticed any mixture of colour in one piece of ground. The kind here cultivated generally grows to a height of three feet."—Hamilton, *Travels in Asia Minor*, ii. p. 115.

separation of the capsules from the plant; and as they contain much oil, its presence (in the L. Prep.) adds to the demulcent properties of the decoction. Some of the properties of the following preparations depend on the presence of Morphia, especially if the poppy-heads be gathered unripe. In ripe Poppy-heads, Mr Groves found, besides Morphia, a larger proportion of *Codeia* than exists in Opium, as well as an undescribed neutral principle. (P. J. xiv. 230.)

Fig. 41.

Decoctum Papaveris, B. Decoction of Poppies.

Prep.—B. Boil *Poppy Capsules* bruised, ℥ij., in *Aq.* Ojß for ten minutes. Strain. Add *Dist. water* till the product measures Oj.

Action. Uses.—A Demulcent Anodyne fomentation, applied to swollen, painful, and inflamed parts, as the eye, abdomen, joints, &c.

Syrupus Papaveris, B. Syrup of Poppies.

Prep.—Macerate *Poppy Capsules* bruised and freed from Seed ℥xxxvj. in *Boiling Dist. water* Oxx., in a water bath, kept hot, for twelve hours. Then evaporate all the water except that absorbed by the capsules, press strongly, and strain. Reduce the strained liquor to three pints; and, when quite cold, add *Rectified Spirit* ℥xv. Mix and filter. Distil off the spirit, evaporate the remaining liquor to two pints, and then add *Refined Sugar* ℔iv. The product should weigh ℔vjß, and have the Sp. Gr. 1·320.

This is an improved process, which was first suggested by Mr Groves. The spirit (which was also used by the L. P.) precipitates mucilage and albumen, and is itself subsequently removed by evaporation. When made without spirit the syrup is apt to ferment.

This is an excellent anodyne and narcotic syrup, when carefully prepared; but it is liable to be carelessly made, as with extract of poppies and syrup, or with laudanum and treacle, and is hence very irregular in strength, and as it is often prescribed to children, becomes dangerous in consequence of their being apt to suffer from an overdose of an opiate. Some recommend that it be prepared by percolation with cold water. It is said to be then less liable to undergo fermentation, but is probably less efficient.

Dose.—fʒij.–f℥ß or more for adults. ♏x. to ♏xv. for infants.

EXTRACTUM PAPAVERIS, B. Extract of Poppies.

Prep.—Take of *Poppy Capsules*, dried, freed from the seeds, and coarsely powdered, ℔j.; *Rectified Spirit*, ℥ij.; *Boiling Distilled water*, a sufficiency. Mix the Poppy Capsules with two pints of the water, and infuse for twenty-four hours, stirring them frequently; then pack them in a percolator, and adding more of the water, allow the liquor slowly to pass until about a gallon has been collected, or the Poppies are exhausted. Evaporate the liquor by a water bath until it is reduced to a pint, and, when cold, add the spirit. Let the mixture stand for twenty-four hours, then separate the clear liquor by filtration, and evaporate this by a water bath until the extract has acquired a suitable consistence for forming pills. (Restored in 1867, from L. P.)

This extract has long been known, being the Meconion of the ancient Greeks. It is a good substitute for opium in many cases, being thought to allay pain and induce sleep, without producing nausea, or the irritability caused by opium. M. Buchner considers that the ripe poppy-head actually surpasses the unripe capsule in its narcotic activity; only that opium cannot be procured from it on account of the inspissated nature of its juices. He therefore recommends an extract of the ripened capsules as a substitute for opium in all cases. (The juice which concretes into opium is not simply the product of the capsule, but flows upwards from all parts of the growing plant.)

Dose.—Gr. ij.–gr. v.

OPIUM, B. The inspissated juice obtained by incisions from the unripe capsules of *Papaver somniferum*, grown in Asia Minor.

Opium, obtained by making incisions into the unripe capsules of the Poppy, and inspissating the juice, seems to have been known from early times. Hippocrates is supposed to have employed it, and Diagoras condemned its use in affections of the eyes and in earache. Dioscorides describes it; but opium does not appear to have been much employed until the time of the Arabs, except in the form of the confections called Mithridatica, Theriaca, and Philonium. The Arabic name *afioon*, the Hindu *aphim*, and the name *afooyung*, by which it is known in China, must all have proceeded from the original Greek name, which is itself derived from οπος, juice. The Sanscrit *apaynum* seems to have a similar origin.

Opium is obtained by a very simple process, consisting merely in making incisions in the evening into the capsules of the Poppy, shortly after the petals fall off, taking care not to penetrate into the interior, when a milky juice exudes, and either concretes upon the capsule, whence it may be taken off in little tear-like masses, or earlier in the morning in a softer state. Upon this it will depend whether the grains run together, or remain separate even when pressed.* When thus collected, the opium requires nothing more than being dried in a warm and airy room, when it becomes of a brown colour, with a shining fracture, and has a strong and peculiar odour. Some Opium which Dr Royle prepared in this manner in the Saharunpoor Botanic Garden in 1828–29, was pronounced by the Medical Board of Bengal to be like Turkey Opium. Most of the Opium made in the Himalayan mountains is similarly prepared, and is of very fine quality. Belon and Olivier describe the Opium of Asia Minor as formed by the assemblage of the small tears collected off the capsules. Dioscorides describes the process as consisting in making incisions into the capsules when the dew has evaporated, collecting the juice in a shell, mixing the several portions, and rubbing them up in a mortar. Kæmpfer gives this as the Persian process, and M. Texier describes it as being adopted in Asia Minor; and it is certainly practised with the immense quantities collected in India in the provinces of Behar and Benares, and of which an excellent description has been given by Dr Butter in the Journal of the Asiatic Society, p. 136. When this method is adopted, the mass will appear homogeneous; when it is omitted it will appear to be composed of agglutinated tears. Both appearances may be observed in the Opium of commerce.

The description of Opium in the B. P. points to Smyrna or Turkey Opium as the only kind used in English medicine. "Irregular lumps, weighing from four ounces to two pounds; enveloped in the remain of poppy leaves; and generally covered with the chaffy fruits of a species of rumex; when fresh, plastic, tearing with an irregular, slightly moist chestnut-brown surface, shining when rubbed smooth with the finger, having a peculiar odour and bitter taste." The description is not altogether correct. The Opium of Asia Minor is sometimes, but not always, enveloped in poppy leaves.

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* In 1844 M. Aubergier made some experiments on the cultivation of the Opium-poppy in France. He found that Opium obtained from the long poppy-heads yielded more Morphia than that which flowed from the round ones. That after the 1st of July, or after the capsule began to turn yellow, the percentage of Morphia in the Opium diminished. He states that the object of not making the incision quite through the pericarp is that after so doing the seeds are lost. They do not ripen, and no oil can be obtained from them. The preparation of this oil is an important source of profit.

The Opiums known in European commerce have been described under the following heads by Prof. Guibourt. That collected in Asia Minor, chiefly in Anatolia, is generally all included under the head of Turkey Opium, and most of it is exported from Smyrna; some of it, however, is taken to Constantinople, whence it is re-exported to other parts of Europe. Some Egyptian is imported into this country. The Persian is scarcely known. The Indian kinds are exported to China.

Smyrna Opium, called also Levant or Turkey Opium, is generally in flattened masses, and, in consequence of its original softness, without any definite regular form; these masses weighing from a half to two pounds, and covered with the capsules of a species of Rumex. It is at first soft, of a distinct brown colour, becoming blackish and hard when dried, losing weight from evaporation of water, and having the strong and peculiar odour of Opium. When examined with a magnifier, it is seen to be composed of yellowish agglutinated tears. This is the purest kind of Opium, yielding about 8 per cent. of Morphia and 4 per cent. of Narcotine, and on an average about 12 per cent. of Hydrochlorate of Morphia.

An inferior kind, however, is also imported from Smyrna, which is more apt to be adulterated, is harder, of a darker colour, appears homogeneous, and may be seen covered either with Rumex capsules, or with the leaves of the Poppy.

The Smyrna Opium is produced at several places, at from 10 to 30 days' distance in the interior; but that grown at Caisar, about 600 miles from Smyrna, is the most esteemed for its cleanness and good quality. Mr Hamilton states that much is produced at Bogaditza; it is made into lumps about four or five inches in diameter, round which leaves are wrapped.

According to M. Landerer, Smyrna Opium is prepared in the interior of Asia Minor, chiefly in Kara Chissar (Caisar), and near Magnesia. It is a compound product. The tears obtained by incisions into the capsules are allowed to flow into small shells, and dried in the sun. This Opium, which is of the best quality, is mixed with an extract prepared by boiling down the fresh leaves of the poppy plant. The mass is then divided into cakes. These are wrapped in fresh poppy-leaves, and placed on shelves to dry. It is thought advantageous that, while drying, they should be exposed to the morning and evening dews. The same writer states, that it is not uncommon for Smyrna Opium to be adulterated with Salep-powder, in order to harden it. This causes the tincture to assume a slimy or mucilaginous consistence.—P. J. x. 474. For an interesting account of the production of Smyrna Opium, by Mr Maltass, see P. J. xiv. 395.

Constantinople Opium, M. Guibourt conceives, may be collected in the northern parts of Anatolia. One kind is in small lenticular pieces about two inches in diameter, weighing from four to eight ounces, and always covered with a Poppy-leaf, the mark of the midrib of which may be seen on the middle of the pieces of Opium.

Another variety is in large irregular cakes. Both are more mucilaginous than the Smyrna kind; and, though of good quality, the Constantinople is less uniform in the quantity of Morphia it contains, some specimens yielding less than, and others as much as, the best kinds of Opium.

Egyptian Opium is in flattened roundish cakes about three inches in diameter, and covered with the remains of some leaf which M. Guibourt was unable to distinguish. It looks well externally, is homogeneous, has something of a reddish hue, not blackening by keeping, but softening on exposure to the air, and has somewhat of a musty smell. It is generally inferior, and M. Guibourt obtained only 4⁄7 of the Morphia yielded by Smyrna Opium.

Persian Opium,—which Dr Pereira calls Trebizond Opium, from his specimens having been obtained from thence. The specimens in the King's College Museum were sent by Mr Morson, to whom M. Guibourt was also indebted. This kind is of a black colour, apparently homogeneous in texture, and in sticks some inches in length, each wrapped up in a separate piece of paper, and tied with a piece of cotton.

Some Opium has been collected in Algiers. A new variety imported from Turkey has been described by Mr Morson (P. J. iv. 503). It resembled the Constantinople, but was soft and light-coloured; contained much wax, caoutchouc, and about 6½ per cent. of Morphia.

Besides these, some Opium is occasionally met with of European manufacture; and it might easily be produced in England if the summer were more regular. In the south of Europe the summer is probably too hot and dry. In India it can only be cultivated in the cold weather. Some good English Opium has been produced, but it is irregular in strength. The quantity of Morphia said to have been obtained from some specimens of French and of German Opium is enormous,—being from 16 to 20 per cent.

Indian Opium is not known in European commerce. The *Saharunpore Garden Opium*, first cultivated by Dr Royle, is of a brown colour, shining fracture, with the strong and peculiar smell of Opium, and yielded the late Professor Daniell, in one of the last analyses he made, 8 per cent. of Morphia. The *Himalayan Opium* possesses similar sensible properties, and though liable to be adulterated, is, when pure, of very fine quality. The *Malwa Opium* is in flat circular cakes, average weight 1½℔., of a rusty-brown colour, strong odour, and bitter permanent taste, varying much in quality. Some Malwa Opium lately analysed yielded only 2 per cent. of Morphia, was oily and mucilaginous, and appeared to have been obtained by expression of the capsules. Dr Smyttan, late Opium Inspector at Bombay, obtained from 3 to 5 per cent. of Morphia from some varieties, and from 7¼ to 8 per cent. from finer kinds. Some *Kandeish Opium* yielded to Mr E. Solly 72 per cent. of soluble matter, and about 7 per cent. of Morphia. The E. I. Government Opium, which is that known under the name of Bengal Opium, and which is chiefly produced in the provinces of Behar and Benares, with some in that of Cawnpore, is also of different qualities: that intended for medicinal use in the hospitals in India is of very fine quality, of a brown colour, and fine smell, packed with great care in 4℔ and 2℔ squares covered with layers of mica, and further defended by a case of brown wax half-an-inch in thickness. This *Patna Garden Opium*, cultivated, prepared, and selected exclusively for the Dispensaries, has yielded about 7 to 8 per cent. and sometimes more (10½) of Morphia. It is of this kind that Dr Christison says, "I have examined specimens little inferior to average Turkey Opium in the quantity of Morphia they contained."

Dr Butter describes the quantity of Opium from each capsule as varying according to soil, irrigation, and to the quantity of dew which falls, but averaging about 1 gr. from each quadruple incision. The tears are of a reddish colour externally, but semi-fluid in the interior, and of a reddish-white colour. The juice is apt to be mixed with dew, and fraudulently with a little water, and will separate into a fluid portion (*passewah*), and into one which is more consistent, the former containing much the largest portion of the Bimeconate of Morphia. The whole of the day's collection is rubbed together in a mortar, so as to break down the grains, and reduce the whole to a homogeneous semi-fluid mass, which should be dried as quickly as possible in the shade, when it is called *pucka*, or matured, being called *kucha*, or raw, in its former state. All samples of Opium brought for sale are submitted to a steam drying process, by which the quantity of fluid in each is easily ascertained. The Opium for the China investment contains about 30 per cent. of moisture: that for medical use in India is made quite dry.

An elaborate and official account of the preparation of Indian Opium has been given by Mr Eatwell, of the Opium Agency of Behar, and is reprinted in the Pharm. Journ. for 1851, with woodcuts illustrating both the culture and manufacture. He has found Benares Opium to contain on the average 3·21 per cent. of Morphia, and 4·06 of Narcotine. The soft Opium, before inspissation, is drained of its more fluid part, or *passewah*. (P. J. xi. 361.) By this separation it is probable that a considerable quantity of the Morphia is lost.

The *Chinese Investment Opium*, which is highly esteemed by the Chinese, is made into cakes or balls, each containing about 4 ℔s; and covered with a thick layer of poppy petals, made to adhere to the Opium and to each other by means of a mixture of passewah and of inferior kinds of Opium and water. It is of a dark-brown colour, of the consistence of an extract when first cut into, containing 70 per cent. of solid matter, and about 2½ per cent. of Morphia.

Prop.—Good Opium, when it has been some time made, is of a dark brown or blackish colour externally, and of a reddish-brown internally, either homogeneous in texture, or formed of agglutinated tears. Sp. Gr. about 3·36. The taste is strongly and permanently bitter, with some degree of acridity, and a little aroma. The odour is both powerful and peculiar. It is hard, and even becomes brittle, when it breaks with a compact shining fracture, and produces a yellowish-brown powder. Some kinds, however, are soft internally, and others never become entirely dry. The B. P., to preserve uniformity of strength, directs dried Opium to be used for the several pharmaceutical preparations, excepting the extract. 14℔ of fresh Smyrna Opium yield 12℔ of dried Opium, or 7℔ of extract (Squire). Opium is softened by the application of heat, and burns at a higher temperature. The effects of the ordinary reagents are these :—Water, either temperate or warmed, dissolves about two-thirds of good Opium, forms a solution of most of its active principles, and becomes of a bitter taste and of a reddish-brown colour. Rectified Spirit takes up four-fifths of the whole mass, including all the active properties of Opium. Ether dissolves much of what is left undissolved by water. Diluted acids take up all its active principles. The alkalies precipitate them from their solutions, but redissolve them when added in excess. They are also precipitated by baryta, lime, and magnesia, and their salts, also by the soluble salts of lead and of other metals, as well as by solutions of tannin and astringent vegetable substances. As some of these are apt to be prescribed with Opium, it is essential to attend to the form of exhibition, for the precipitate may contain all the active principles, and the solution be inert ; or it may be made active again by using an excess of ammonia or potash ; or the active principle may be taken up by the acid of some of the salts used. But these various effects of reagents can be duly appreciated only when the composition of Opium is understood.

Several analyses were made of Opium before any just ideas were obtained respecting its constitution. Derosne in 1803 first obtained a saline body. Sertürner and Seguin, the first a Hanoverian, and the second a French apothecary, both discovered in 1804 another crystallisable substance, upon which subsequent experience has proved the narcotic power of Opium to depend. In a second memoir of Sertürner published in 1817, he announced his discovery of the existence of *Morphia* combined with *Meconic acid.* This was confirmed by Robiquet. Since then, Geiger, Beltz, Pelletier, Couerbe, Schmidtz, Mulder, and others, have analysed Opium, and shown it to consist of a variety of principles. Of these, three are alkaline—*Morphia*, *Codeia*, and *Thebaia.* A fourth, *Narcotine*, though neutral to colours, forms salts with acids : of this a great portion is in a free state, and may at once be separated from Opium by Ether : the remainder, as well as the whole of the *Morphia* and *Codeia*, are in combination with the *Meconic* and some *Sulphuric acid* found in Opium. Two neutral principles, *Narceine* and *Meconine*, are also contained in Opium. Besides these three are four other bases or principles, about which little is known. They are found in very small quantities, and do not occur in all specimens ; they are called *Opiania*, *Papaverine*, *Pseudo-Morphine*, and *Porphyroxine*. Opium is said further to contain a brown acid extractive, resin, and fixed oily matters.

There is also a trace of Volatile oil (the odorous principle ?), with Gum, Bassorine, Albumen, Caoutchouc, Lignin, and Salts of inorganic bases.

The only satisfactory test for Opium is the determination of the quantity of Morphia it contains. (*See* below.) It should amount to 6–8 per cent. (B.)

MORPHIA. *Symb.* Mor. Fr. *Morphine.* The chief active principle of Opium.

Morphia ($C_{34}H_{19}N\,O_6$)* is found in Opium in the proportion of 2 to 8 or 10 per cent., and is the principle upon which its medicinal properties chiefly depend. It crystallises in shining flat six-sided prisms, but is usually in the state of a very white powder, is without smell, but has a very bitter taste. It is very little soluble in cold water, scarcely even in boiling water, but very readily in alcohol; *i. e.*, in 40 of cold anhydrous alcohol, and in 30 parts of ordinary alcohol at 212°; nearly insoluble in ether and the fixed and volatile oils. The alcoholic solution exhibits alkaline properties, when tried with turmeric; and when the spirit is distilled from it, it yields crystals, which are totally destroyed by heat: at first about 6·33 per cent. of water are expelled; with further heat, it melts into a yellowish liquid, and in the air burns with a bright flame. On the addition of Nit′, Morphia becomes first red, and afterwards yellow. Tinct. of Perchloride of Iron gives it a blue colour. Chlorine, and afterwards Ammonia, being added to its salts, they are rendered of a brown colour, which colour is destroyed when more Chlorine is added. With solutions containing Iodic acid, it produces a brown colour by the liberation of Iodine. Morphia is precipitated from its salts by solution of Potash (also by Ammonia and Lime water), which, added in excess, redissolve it. It is precipitated by Tannic′, as by infusion of gall-nuts, Tannate of Morphia being formed. Morphia forms salts with S′, H Cl, and Ac′: these are crystallisable, colourless when pure, and of a bitter taste.

Prep.—Morphia, being combined with Meconic acid, may be precipitated from a watery solution of Opium either by Ammonia or by Magnesia, which enter into combination with the Meconic acid. It may then be separated from the other insoluble matters by the agency of alcohol; or it may be obtained in a pure state by precipitating with an alkali the solution of one of its salts. Morphia, in the pure state, is not officinal in the B. P.

Prep.—Morphia may be precipitated by Ammonia from the solution of the Hydrochlorate. Any Codeia present in the salt is not precipitated. Or it may be made by acting on Opium with caustic lime and water, when the alkaloid is separated in combination with the lime; H Cl is then added to combine with both, and the Morphia precipitated by Ammonia. This is the method adopted in the B. P. of separating Morphia from Opium, and thus ascertaining the

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* It is right to observe that there is a considerable difference of opinion among chemists as to the formulæ of Morphia and the other principles of Opium.

goodness of the drug. "Take of *Opium* gr. c., *Slaked Lime* gr. c., *Distilled water* ℥iv. Break down the Opium, and steep it in an ounce of the water for twenty-four hours, stirring the mixture frequently. Transfer it to a displacement apparatus, and pour on the remainder of the water in successive portions, so as to exhaust the Opium by percolation. To the infusion thus obtained, placed in a flask, add the lime, boil for ten minutes, place the undissolved matter on a filter, and wash it with an ounce of boiling water. Acidulate the filtered fluid slightly with dilute Hydrochloric acid, evaporate it to the bulk of half an ounce, and let it cool. Neutralise cautiously with solution of Ammonia, carefully avoiding an excess; remove by filtration the brown matter which separates, wash it with an ounce of hot water, mix the washings with the filtrate, concentrate the whole to the bulk of half an ounce, and add now solution of Ammonia in slight excess. After twenty-fours collect the precipitated Morphia on a weighed filter, wash it with cold water, and dry it at 212°. It ought to weigh at least from six to eight grains."

Morphia is also obtained in the course of the B. process for the preparation of the Hydrochlorate. (*See* below.)

Tests.—The characteristics of Morphia have been noticed above, but they can only be seen in pure Morphia. Narcotine, which is sometimes present, is insoluble in the solution of potash.

Action. Uses.—Morphia possesses nearly all the actions of Opium, but is less stimulating. Being, however, nearly insoluble in cold water, it is usually prescribed in the form of some of its salts, which are more certain in their operation. Both Morphia and its salts have frequently been employed endermically on the Continent.

Dose.—Gr. ¼ to gr. j., gradually increased. Gr. j. in fine powder may be applied to the denuded skin.

MORPHIÆ HYDROCHLORAS, B. Hydrochlorate of Morphia.

Hydrochlorate of Morphia ($\text{Mor}+\text{H Cl}+6\text{ Aq.}$) came into notice in 1831, with Dr W. Gregory's method of obtaining Morphia. It must be distinguished, however, from what is commonly called *Gregory's Salt*, which is a compound of Hydrochlorate of Morphia and of Codeia. It is without colour or smell, is extremely bitter, in fine powder or in feathery acicular crystals, is soluble in about 16 parts of cold, and in its own weight of boiling water. This, on cooling, congeals into a crystalline mass. It is also soluble in rectified Spirit. Dil. Sul′ decomposes it, as do the alkalies. Nit′ forms with it a reddish-yellow, and Sesquichloride of Iron a bluish-coloured fluid. In the L. P. this salt was included among the Materia Medica, no formula of preparation being given. It is composed of Mor. 76·24 H Cl 9·66 Aq. 14·10=100.

Prep.—It may be prepared by acting on Morphia with H Cl, or by decomposing the Meconate of Morphia in Opium with some other salt, which shall produce an insoluble Meconate and a soluble Hydrochlorate of Morphia. The late L. P. formula prescribed Chloride of Lead. Dr A. T. Thomson used Chloride of Barium. In the B. P., as in the E. P., Chloride of Calcium is employed according to Dr Gregory's original process.

Prep.—B. Take of *Opium*, sliced, ℔j.; *Distilled water*, a sufficiency; *Chloride of Calcium*, ℥¾; *Solution of Ammonia*, a sufficiency; *Purified Animal Charcoal*, ℥¼; *Dilute Hydrochloric acid*, f℥ij., or a sufficiency. Macerate the Opium for twenty-four hours with two pints of the *Water*, and decant. Macerate the residue for twelve hours with two pints of the *Water*, decant, and repeat the process with the same quantity of the *Water*, subjecting the insoluble residue to strong pressure. Unite the liquors, evaporate on a water bath to the bulk of one pint, and strain through calico. Pour in now the *Chloride of Calcium* previously dissolved in four fluid ounces of *Distilled water*, and evaporate until the solution is so far concentrated that upon cooling it becomes solid. Envelope the mass in a double fold of strong calico, and subject it to powerful pressure, preserving the dark fluid which exudes. Triturate the squeezed cake with about half a pint of *Boiling Distilled water*, and, the whole being thrown upon a paper filter, wash the residue well with *Boiling Distilled water*. The filtered fluids having been evaporated as before, cooled, and solidified, again subject the mass to pressure; and, if it be still much coloured, repeat this process a third time, the expressed liquids being always preserved. Dissolve the pressed cake in six fluid ounces of *Boiling Distilled water*, add the *Animal Charcoal*, and digest for twenty minutes; filter, wash the filter and charcoal with *Boiling Distilled water*, and to the solution thus obtained add the *Solution of Ammonia* in slight excess. Let the pure crystalline Morphia which separates as the liquid cools, be collected on a paper filter, and washed with cold *Distilled water* until the washings cease to give a precipitate with solution of Nitrate of silver acidulated by Nitric acid.

From the dark liquids expressed in the above process an additional product may be obtained by diluting them with *Distilled water*, precipitating with solution of Potash added in considerable excess, filtering, and supersaturating the filtrate with Hydrochloric acid. This acid liquid digested with a little animal charcoal, and again filtered, gives upon the addition of ammonia a small quantity of pure Morphia.

Diffuse the pure Morphia, obtained as above, through two fluid ounces of *Boiling Distilled water* placed in a porcelain capsule kept hot, and add, constantly stirring, the *Dilute Hydrochloric acid*, proceeding with caution, so that the Morphia may be entirely dissolved, and a neutral solution obtained. Set aside to cool and crystallise. Drain the crystals, and dry them on filtering paper. By further evaporating the mother liquor, and again cooling, additional crystals are obtained.

The cold watery solution contains the Meconate of Morphia and other soluble constituents of Opium. On the addition of $Ca\,Cl$, Meconate of Lime is formed, with Hydrochlorates of Morphia and Codeia. The semi-solid mass obtained by evaporation contains these salts. The colouring matter, with some liquid holding the Hydrochlorates in solution, is squeezed out by the pressure applied. Another solution in water, another evaporation and pressure, obtains the Hydrochlorates in a purer state. The same proceeding is repeated a third time, if necessary. The cake is now decolorised by solution in water, and digestion with a small quantity of animal charcoal. Ammonia being added, the Morphia is precipitated in a crystalline state, Hydrochlorate of Ammonia being left in solution, with Codeia. The Morphia is washed, and some more being obtained from the dark liquid produced by the expression, the whole product, is saturated with $H\,Cl$, and crystals obtained by evaporation.

Instead of using charcoal, the salt may be decolorised by repeated solution, crystallisation, and strong pressure in the folds of a cloth. Dr Christison states, that it is important not to employ too much water, that about four times the weight of the Opium employed is sufficient to exhaust it, that the Chloride of Calcium should be added before instead of after concentrating the infusions, and that the evaporations should be conducted as quickly as possible, at a heat below 212°. By following this process, the Edinburgh manufacturers obtain about 13 per cent. of very pure and white Hydrochlorate of Morphia from the recent soft Smyrna Opium.

Tests.—Snow-white, in silky acicular prisms; entirely soluble in rectified spirit and in water: solution colourless: loss of weight at 212° not above 13 per cent. At a higher temperature it is destroyed, leaving no residue. With Potash it gives a white precipitate, soluble in excess. 20 grs. in ½ oz. of warm water, treated with Ammonia in excess, yield a precipitate of Morphia, which, when dried, weighs

15·18 grs. The precipitate thrown down in its solution by Nitr. Silver, is not soluble in H Cl or N′, but soluble in Ammonia. Narcotine, if present, would be detected by not being entirely soluble in an excess of Potash by which it had been precipitated from a solution. The Hydrochlorate answers to the other chemical tests for Morphia. The commercial salt has been known to be adulterated with Salicine. This will become red on the addition of pure Sulphuric acid.

Action. Uses.—May be advantageously substituted for Opium in most cases as a sedative anodyne, diaphoretic, &c.

Dose.—Gr. ¼–gr. ½; a Narcotic poison in doses of gr. v.–gr. x.

Liquor Morphiæ Hydrochloratis, B. Solution of Hydrochlorate of Morphia.

Prep.—B. Take *Hydrochlorate of Morphia*, gr. iv.; *Dilute Hydrochloric acid*, ♏viij.; *Dist. water* ʒvj., and *Rect. Spirit* ʒij. Mix and dissolve. Each fʒj. contains ½ gr.

Dose.—♏x.–ʒj., half as strong as the solution of the L. P.

Trochisci Morphiæ, B. Morphia Lozenges.

Prep.—B. Dissolve *Hydrochlorate of Morphia* gr. xx. in *Dist. water* ℥ß, add this solution to *Tincture of Tolu* ℥ß, previously mixed with *Mucilage of Gum Arabic* ℥ij. or q. s., and with *Gum Arabic* in powder ℥j., and *Refined Sugar* in powder ℥xxiv., also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains one thirty-sixth of a grain of Hydrochlorate of Morphia.

Action. Uses.—Sedative, &c. Much used in this or the following form in combination with Ipecacuanha for allaying cough.

Dose.—x.–xx. lozenges daily. These and the following are adopted from the E. P.

Trochisci Morphiæ et Ipecacuanhæ, B. Morphia and Ipecacuanha Lozenges.

Prep.—B. Dissolve *Hydrochlorate of Morphia* gr. xx. in *Dist. water* ℥ß, add this solution to *Tincture of Tolu* ℥ß, previously mixed with *Mucilage of Gum Arabic* ℥ij. or q. s., and with *Ipecacuan* in fine powder gr. lx., *Gum Arabic* in powder ℥j., and *Refined Sugar* in powder ℥xxiv., also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains one thirty-sixth of a grain of Hydrochlorate of Morphia, and one-twelfth of a grain of Ipecacuan.

Dose.—x.–xx. lozenges daily in irritable coughs.

Suppositoria Morphiæ, B. Morphia Suppositories.

Prep.—Take of *Hydrochlorate of Morphia*, gr. vi.; *Benzoated Lard*, gr. lxiv.; *white Wax*, gr. xx.; *Oil of Theobroma*, gr. xc. Melt the Wax and Oil of Theobroma with a gentle heat, then add the Hydrochlorate of Morphia and Benzoated Lard previously rubbed together in a mortar, and mix all the ingredients thoroughly. Pour the mixture while it is fluid into suitable moulds of the capacity of 15 grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository, which will contain half-a-grain of Hydrochlorate of Morphia.

Introduced in the B. P. (1864).

Action. Uses.—When introduced *per anum*, the Morphia, becoming dissolved, exerts its anodyne and constipating action. Used in painful affections of the lower bowel, bladder, or uterus; in difficult parturition, after operation for stone, or in dysentery.

MORPHIÆ SULPHAS.—Sulphate of Morphia is occasionally employed in medicine. A small portion exists naturally in Opium, and it may readily be made by acting on Morphia with dil. Sul′. In the United States' Pharmacopœia there is a Solutio or Liquor Morphiæ Sulphatis. The Sulphate may be prescribed in doses of gr. $\frac{1}{8}$ to gr. $\frac{1}{4}$, but it does not appear preferable to the Hydrochlorate, though frequently employed on the Continent, especially endermically.

MORPHIÆ ACETAS, B. Acetate of Morphia.

$(C_{34} H_{19} N O_6, C_4 H_3 O_3 + H O)$. Vinegar has long been thought a good menstruum for dissolving the active properties of Opium, but the true Acetate of Morphia was introduced into practice by Majendie. When pure, it is seen as a colourless, snow-white powder, of an intensely bitter taste, imperfectly crystallised. It is apt to be decomposed, from some of its acid escaping, and Morphia being left, which is insoluble. Hence in prescribing it is necessary to add a few drops of Acetic acid to its aqueous solution. It is soluble in rectified Spirit, readily decomposed by heat as well as by dil. Sul′, with the disengagement of Acetic acid. Its solution is rendered reddish-yellow by Nit′, and blue by Perchloride of Iron.

Prep.—B. Take of *Hydrochlorate of Morphia*, ℥ij.; *Solution of Ammonia, Acetic acid, Distilled water*, of each, a sufficiency. Dissolve the Hydrochlorate of Morphia in 1 pint of Distilled water, and add Solution of Ammonia until the Morphia is precipitated and the liquid rendered slightly alkaline. Collect the precipitate on a filter, wash it with Distilled water, then having transferred it to a porcelain dish, add four ounces of Distilled water and a sufficient quantity of Acetic acid to neutralise and dissolve it. Evaporate the solution by the heat of a water bath until it concretes on cooling. Lastly, dry the salt with a gentle heat, and reduce it to powder.

Tests.—Very readily dissolved in water. When $S O_3$ is added, Acetous vapours are evolved. Its other properties are such as have been stated of Morphia.

Action. Uses.—Though liable to decomposition, it is preferred by some to the other salts of Morphia, in doses of gr. $\frac{1}{8}$ to $\frac{1}{4}$. A Syrup is lauded by M. Forget in doses of gr. $\frac{1}{16}$ in chronic bronchitis.

LIQUOR MORPHIÆ ACETATIS, B. Solution of Acetate of Morphia.

Prep.—Take of *Acetate of Morphia*, gr. iv.; *Diluted Acetic acid*, ♏viij.; *Rectified Spirit*, fℨij.; *Distilled water*, f℥vj. Mix the acid, the spirit, and the water, and dissolve the Acetate of Morphia in the mixture.

Dose.—♏x.-♏lx.

CITRATE OF MORPHIA was recommended by Dr Porter of Bristol under the form of Liquor Morphiæ Citratis, and made by macerating Opium ℥iv. with Citric′ ℥ij., and Aq. dest. Oj. It does not appear necessary, as the officinal preparations of Morphia seem sufficient.

Bimeconate of Morphia.—Mr Squire, thinking it likely that the natural salt, separated from the other ingredients, existing in Opium, might prove the best therapeutic agent, has prepared a solution of the Bimeconate of Morphia, which is nearly of the same strength as Laudanum. Several practitioners have borne testimony to its being less exciting than Opium, and equally if not more efficacious than the other preparations of Morphia.

Codeia ($C_{36}H_{21}NO_6 + 2$ Aq. when crystallised from Aq.) was discovered by Robiquet in 1832. Its Hydrochlorate crystallises with the Hydrochlorate of Morphia in the process p. 308 ; but as the Codeia is not precipitated by the Ammonia, it may be obtained from the mother liquor, from which Morphia has been precipitated, by subsequent evaporation. It crystallises in needles or right rhombic prisms, is alkaline in nature, and forms salts with acids, is soluble in water and in Alcohol, readily in Ether ; insoluble in solution of Potash ; does not become blue on the addition of Perchloride of Iron. Opium contains about ½ or 1 per cent. It has little taste ; some state it to be excitant, and others hypnotic ; but it resembles Morphia in its effects, only three or four times as much is required.

Thebaia, or Paramorphia ($C_{38}H_{21}NO_6$), is alkaline in its reactions, and forms crystallisable salts with diluted acids ; most nearly resembles Narcotine, but is distinguished from it by crystallising in short needles ; fuses at 302, is much more soluble in Alcohol, is acrid and not bitter in taste, and little soluble in water.

[Opiania, discovered in Egyptian Opium in 1852, bears a strong resemblance to Morphia in its chemical reactions and medicinal power. It is less soluble in Alcohol, and crystallises in fine needles.]

Narcotine (Anarcotina, Beng. Disp.) ($C_{46}H_{25}NO_{14}$) was discovered by Derosne in 1803, and its properties investigated by Robiquet in 1817. Much of it is in a free state, and may be dissolved out of Opium by Ether. It exists in the proportion of 1 to 8 per cent. It crystallises from Alcohol in bevelled pearly tables, but from Ether in regular rhombic prisms ; is white, without odour, and insipid ; is insoluble in cold water and in solution of Potash, very soluble in Ether, in Alcohol, and in volatile oils ; neutral to vegetable colours ; combines with diluted acids, and forms salts, as the Hydrochlorate, Sulphate, &c., which are very soluble and bitter. When pure, it does not form a blue solution with Perchlor. Iron, nor produce a brown colour when treated with Chlorine and Ammonia. It is not reddened by Nit′, but is so by S′ containing a trace of N′ ; or if the Narcotine be dissolved in strong Sul′, and a particle of Nit. Potash be added, a solution of a crimson colour is produced. From the decomposition of Narcotine, *Opianic acid* is formed, remarkable for its affinity for Ammonia, also *Cotarnin*, &c. (Liebig.) Narcotine may be obtained by macerating the Opium which has been exhausted by cold water in the process for obtaining

Hydrochlor. Morphia with weak Pyroligneous or Hydrochloric acid, and precipitating with Potash. It may be separated from Morphia by Ether or by Potash—the first dissolving the Narcotine and leaving the Morphia, while the Potash dissolves the Morphia, but leaves the Narcotine.

Action. Uses.—It appears to be devoid of all narcotic properties. Dr Roots prescribed its Sulph. in doses up to gr. xx. as a substitute for the Sulph. of Quinia for the cure of intermittents. It has been largely employed in India for arresting the paroxysms of intermittent and remittent fevers by Dr O'Shaughnessy and other practitioners.

NARCEINE ($C_{46} H_{29} N O_{18}$) was discovered by Pelletier, and is in fine silky needles, which are slightly bitter, soluble in water, fusible at about its boiling point, neutral to test-paper, and not neutralising acids. The diluted mineral acids produce a light blue (N′ a yellow) colour when brought in contact with it, as also does Iodine.

MECONINE ($C_{10} H_5 O_4$?) is also white, crystallises in six-sided prisms, is acrid in taste, fuses at 194°, is soluble in water, neutral to acids. If Chlorine gas be brought in contact with it when in a fused state, a blood-red fluid is produced, which crystallises on cooling. It is remarkable in not containing any Nitrogen.

[PAPAVERINE, discovered in 1848 by Dr Merck of Darmstadt, bears a considerable resemblance to Narcotine, but it is said to have the composition of $C_{40} H_{21} N O_8$, and it turns blue when moistened with Concent. Sulph. acid.

Mention has already been made of some other compounds, little understood as yet, which have been occasionally found in Opium.]

MECONIC ACID ($C_{14} H O_{11} + 3 H O = 200$), discovered by Sertürner, was studied by Robiquet. It is seen in the form of white, transparent, micaceous scales. It is soluble in water: when this solution is boiled, it is decomposed into Carbonic acid and *Metameconic* acid, which forms hard crystalline grains. By destructive distillation of Meconic acid, another acid, the *Pyromeconic*, is produced. Mec′ readily forms salts, and is remarkable for producing a deep red colour with the persalts of Iron, and a green precipitate of Mecon. Copper with Ammon. Sulph. Copper. It may be obtained by decomposing the Mecon. Lead or that of Lime (*see* p. 308) with dil. H Cl.

Brown Acid Extractive has been little examined, and is no doubt a mixture of several substances, perhaps the result of some changes which have taken place. It is supposed to possess some of the narcotic properties of Opium. *Resin of Opium* contains Nitrogen, is brown, insipid, and without odour, softens by heat, is soluble in Alcohol, and in alkaline solutions, and remarkable for its electro-negative properties. *Oily* or *Fatty Matter* of Opium is probably colourless when pure, commonly yellow or brownish, acid, its alcoholic solution reddens Litmus, it combines with alkalies, and forms soaps, from which it may again be separated, unchanged, by the action of acids. The nature of the *odorous principle* of Opium is unknown, as it has never been isolated. It may be a volatile oil, as it rises with water when this is distilled off Opium. (Soubeiran, Traité de Pharm. i. p. 364, and Turner's Chem. p. 1159.)

Adulterations of Opium.—Opium is of different degrees of value, according to its sensible properties and the quantity of Morphia it contains ; but it is subject to adulterations. First, it may be mixed up with too much water, either intentionally, or in consequence of the dew having been very heavy. The quantity may be ascertained by the loss on evaporation. The most injurious fraud is that of washing out the soluble and most valuable parts of Opium, and bringing the residual mass for sale. In this case Butter states that Opium loses its translucency and redness of colour, also its adhesiveness. Sand, clayey mud, sugar, molasses, cow-dung, Salep, Datura-leaves, the glutinous juice of Ægle Marmelos, and even pounded poppy-seeds, are employed to adulterate Opium. Malwa Opium often contains oil and other matters, obtained by the expression of the poppy-heads. Some Opiums from which Morphia has been extracted have been occasionally met with in European commerce. To be enabled to judge of good Opium, one must be well acquainted with the different varieties of Opium, their respective colours, tastes, and textures, as well as the natural degree of moisture, and see that no mechanical admixtures are apparent, nor left on a filter. Several methods have been proposed for ascertaining the quantity of Morphia in Opium, of which that in the B. P. (p. 308) is one of the best.*

Tests.—In cases of poisoning, the sensible appearances must necessarily differ according as a solid or a liquid preparation of Opium, or one of Morphia, has been employed. If either of the former, then the brownish colour, bitter taste, and peculiar odour, will indicate the presence of Opium. But in many cases the poison has entirely disappeared from the stomach, and the odour is alone recognisable,—especially on the first opening of the stomach. This odour is more perceptible, in any fluid containing it, on increasing the temperature (short of the boiling point, when some decomposition takes place). The other tests are of a chemical nature, and have been already enumerated in describing the crystallisable ingredients of Opium ; such as Nitric acid and Tinct. of Perchloride of Iron, both of which produce a red colour in a solution of Opium, the first from acting on its Morphia, and the second on the Meconic acid. In the case of organic mixtures, it is necessary first to make an aqueous extract of the contents of the stomach, &c., and then from that an alcoholic one. Dr Christison has said that the evidence

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* For analytical purposes, M. Guilliermond states that Morphia may be extracted from Opium in the following way:—15 parts of Opium are exhausted by careful trituration with 100 parts of rectified spirit. To the filtered tincture Ammonia is added in excess. When the solution has stood for 12 hours, crystals of Morphia and Narcotine separate from it. These are washed to free them from Meconate of Ammonia. The Narcotine is then dissolved out by Ether, and the Morphia dried and weighed.

of Opium being present is irrefragable if the alcoholic extract present the peculiar bitterness of Opium,—if its watery solution, when acted on by Ammonia cautiously added, so as to avoid excess, yield a precipitate (Morphia) which becomes yellow with Nitric acid,—and if after the separation of this precipitate the remaining fluid (then containing Meconate of Ammonia) gives, with Acetate of Lead, a precipitate (Meconate of Lead), which, when decomposed in water by Sulphuretted Hydrogen (Sulphuret of Lead being formed, Meconic acid dissolved) imparts to the water the property of becoming deep cherry-red with Perchloride of Iron. Dr Taylor finds that N′ detects gr. $\frac{1}{15}$ of Hydrochlor. Morphia diluted in 300 parts of water; Perchlor. Iron gr. $\frac{1}{11}$ in 231 parts of water; and Iodic′ gr. $\frac{1}{100}$ in 1300 parts of water; but this last is open to fallacy with organic fluids. The *Iron test for Meconic′* is more delicate than the tests for Morphia.

Action and Uses of Opium.—Opium may be taken as the type of Narcotic agents. It first exalts the nervous sensibility, and then diminishes it. It has also a special action on the brain, which results in sleep. Applied *externally*, it is at first stimulant,—producing pain, as on the eye, and then sedative. When taken *internally*, in small doses, excitement is first produced, as apparent in the increased frequency of the pulse and heat of the skin. This is soon followed by diminished sensibility, calmness, and sleep, with abatement of pain, and by a suspenion of mucous secretions, with the exception of that of the skin. But if the tendency to sleep be resisted, Opium, in moderate doses (and in those habituated to its use, in excessive doses), will produce intellectual excitement accompanied by bodily activity,—soon to be followed by general debility, as is exemplified in Opium-eaters. In large doses, it is a narcotic poison. It is frequently employed as an anodyne and hypnotic, as a sedative, to restrain inordinate discharges, as in diarrhœa and cholera, as a diaphoretic, as an antispasmodic, and even as a febrifuge. In Delirium Tremens it is beneficially given in large doses; and, combined with Calomel and sometimes with Ipecacuanha, may be used even in inflammatory affections, though in general it is contra-indicated when there is inflammation or much fever. It is no doubt the most important of all therapeutical agents, and that perhaps which is the most frequently employed.

Dose.—Opium may be administered internally either in a solid or liquid form, or its effects obtained by using one of its salts; or it may be applied externally, or introduced endermically. The medium dose is one grain, but it is subject to great variation, being often sufficient in much smaller doses, and at other times requiring to be increased to an extraordinary extent. It may often be advantageously introduced into the rectum, either as a suppository, or in the form of an Enema. Externally it may be applied endermically, or by friction in a liniment, or added to lotions, collyria, cataplasms, or plasters, by means of some of the following preparations.

Preparations of Opium.

Extractum Opii, B. Extract of Opium.

Prep.—B. Macerate *Opium* in thin slices, ℔j., in two pints of *Dist. water* for twenty-four hours, and express the liquor. Reduce the *Opium* to a uniform pulp, macerate it again in two pints of the *Water* for twenty-four hours, and express. Repeat the operation a third time. Mix the liquors, strain through flannel, and evaporate by a water bath to a proper consistence for forming pills.

This extract is of a brownish colour, of a bitter taste, and without odour. The parts soluble in water (*see* p. 306), with a little of the resin, are taken up, and the insoluble, with some active principles, however, left behind. This extract is considered to be less exciting than pure Opium, and is therefore occasionally preferred in some of the cases for which Opium or the salts of Morphia are indicated. But as it is uncertain, the Morphia salts seem preferable in cases where constitutional disturbance is to be avoided, and crude Opium or Laudanum can alone be relied upon in urgent cases.

Dose.—Gr. $\frac{1}{2}$–gr. iij.

Extractum Opii Liquidum, B. Liquid Extract of Opium.

Prep.—B. Digest *Extract of Opium* ℥j. in *Dist. water* ℥xvj. for an hour, stirring frequently; filter, and add *Rect. Spirit*, ℥iv. The product should measure one pint.

It contains nearly 1 part of the extract in 20. (Gr. xxij. in ℥j.). It resembles Battley's Solution of Opium, but is stronger.

Dose.—♏x.–♏xxx.

Pilula Saponis composita, B. P. Opii, B. (1864). Opium Pill. Compound Soap Pill.

Prep.—B. Reduce *Hard Soap*, ℥ij., to a fine powder, add *Opium* in fine powder, ℥ß, with *Dist. water*, q. s., and beat into a uniform mass. (Old name of L. P. restored.)

Gr. v. contain Opium gr. j. 1 to 2 pills for a dose.

[Pilula Styracis composita, L. (*See* Styrax.)

Opium gr. j. in gr. v. of the Pill. Gr. v.–gr. x. for a dose.]

Pilula Plumbi cum Opio, B. (P. 195.)

This Pill contains Meconate of Lead and Acetate of Morphia. 1 gr. in 8 of Opium.

Pilula Ipecacuanhæ cum Scilla, B. (*See* Ipecacuanha.)

Gr. $\frac{3}{10}$ of Opium in gr. v. of the Pill.

Trochisci Opii, B. Opium Lozenges.

Prep.—B. Take of *Extract of Opium*, grs. lxxij.; *Tincture of Tolu*, f℥ß; *Refined Sugar*, in powder, ℥xvj.; *Gum Arabic*, in powder, ℥ij.; *Extract of Liquorice*, ℥vj.; *Distilled water*, a sufficiency. Add the Extract of Opium, first softened by means of a little water, and the Tincture of Tolu, to the Extract of Liquorice heated in a water bath. When the mixture is reduced to a proper consistence remove it to a slab, add the Sugar and Gum previously rubbed together, and mix thoroughly. Divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains one-tenth of a grain of Extract of Opium. Those of the shops usually contain about ⅛ of a grain of Opium. Both are useful, like the Morphia lozenges, in allaying troublesome cough.

PULVIS CRETÆ AROMATICUS CUM OPIO, B. Pulvis Cretæ Opiatus. Aromatic Powder of Chalk with Opium.

Prep.—B. Take of *Aromatic Powder of Chalk*, ℥ix¾; *Opium*, in powder, ℥¼. Mix them thoroughly, pass the powder through a fine sieve, and finally rub lightly in a mortar. Keep it in a stoppered bottle.

Same strength as *Pulv. Cretæ cum Opio*, L. One grain of Opium in 40, with Cinnamon, Saffron, Nutmeg, Cloves, Cardamoms, and Chalk (1 in 4).

Action. Uses.—Antacid, Astringent, Stimulating, and Narcotic. Useful in some Diarrhœas in doses of gr. x–gr. xxx.

PULVIS IPECACUANHÆ COMPOSITUS, B. (*See* Ipecacuanha).
Contains of Opium gr. j. in gr. x. of the powder.

PULVIS KINO COMPOSITUS, B. (*See* Kino.)
Contains of Opium gr. j. in gr. xx. of the powder.

PULVIS OPII COMPOSITUS, B. Compound Powder of Opium.

Prep.—Take of *Opium*, in powder, ℥jß; *Black Pepper*, in powder, ℥ij.; *Ginger*, in powder, ℥v.; *Caraway Fruit*, in powder, ℥vj.; *Tragacanth*, in powder, ℥ß. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.

This powder nearly represents the dry ingredients of Confectio Opii, Lond. Introduced in 1867.

Dose.—Gr. ii.–gr. v.

CONFECTIO OPII, B. Confection of Opium.

Prep.—Take of *Compound Powder of Opium*, gr. cxcii.; *Syrup*, f℥i. Mix.

Introduced in 1867. It resembles Confectio of L. P.

A substitute for the old Theriaca ; contains about Opium gr. j. in gr. xxxvj. Stimulant and anodyne, appropriate in the treatment of Chronic Diarrhœas, &c., in doses of gr. x.–gr. lx.

TINCTURA OPII, B. Tincture of Opium. Laudanum.

Prep.—B. Macerate *Opium* in coarse powder, ℥jß, for seven days in *Proof Spirit* Oj. Strain, express, and filter. Add sufficient Proof Spirit to make one pint.

Laudanum is of a deep brownish-red colour, with the peculiar taste and odour of Opium. To make it by maceration requires seven days. It may be made more quickly by percolation. The ounce of the B. P. being smaller than that of the L. P., this laudanum is a little weaker than the old preparation. Gr. xxxiii. of Opium are used to make f℥j. About 1 gr. of Opium is employed to make

14½ minims of tincture (13, L.) 19 minims of the L. tincture are required to yield on evaporation 1 gr. of solid residue. Dr Christison states that f℥j. of good tincture should yield from 17 to 22 grains of perfectly dry matter. Some Morphia is contained in the residuum, and has been separated by Dr Pereira. Mr Haden used to make a substitute for Liq. Opii Sedativus by macerating the lees with Tar′. M. Martin, by fermenting the lees with sugar, obtained an extract possessed of narcotic properties.

Action. Uses.—Laudanum is a powerful anodyne and narcotic, and the form in which the effects of Opium may most effectively be obtained either externally or internally.

Dose.—♏x.–fʒß; but much larger does may be exhibited in particular cases. Great caution is required in prescribing it to children. Infants have been killed by 4 drops, and unpleasantly deep sleep has been produced even by 2 drops. (*c.*)

TINCTURA OPII AMMONIATA, B. Ammoniated Tincture of Opium. *Scotch Paregoric.*

Prep.—Take of *Opium*, in coarse powder, gr. c.; *Saffron*, cut small, *Benzoic acid*, of each, gr. clxxx.; *Oil of Anise*, fʒj.; strong *Solution of Ammonia*, f℥iv.; *Rectified Spirit*, f℥xvj. Macerate for seven days in a well-closed vessel, with occasional agitation, then strain, press, filter, and add sufficient Rectified Spirit to make one pint.

Introduced in 1867, from old E. P. It contains gr. v. of Opium in ℥j.

Dose.—fʒß–fʒj.

VINUM OPII, B. *Laudanum Liquidum Sydenhami*, Ph. L. 1720. *Tinctura Thebaica*, Ph. L. 1745. Wine of Opium.

Prep. B.—Take of *Extract of Opium*, ℥j.; *Cinnamon Bark*, bruised, *Cloves*, bruised, of each, grs. lxxv.; *Sherry*, Oj. Macerate for seven days in a closed vessel, with occasional agitation, and filter.

It contains gr. xxij. of extract of Opium, nearly, in f℥j. (This is about ¼ stronger than Vinum Opii of the B. P. 1864, and also of the E. and D. P. It is about ⅕ weaker than Vinum Opii, Lond., and corresponds in strength with Extractum Opii Liquidum, B.)

Wine of Opium, Sydenham's Liquid Laudanum in B. P. 1864, differed from the tincture only in the menstruum. Like that of the L. P. it is now made with the Extract, and with aromatics. It is more agreeable in taste and smell, and may be used in many cases for the same purposes as laudanum. Dr Paris has proposed adding the Opium to wine during its state of fermentation.

Dose.—♏x.–fʒj. Often dropped into the eye in Ophthalmia.

TINCTURA CAMPHORÆ COMPOSITA, B. Tinct. Camph. cum Opio, (B. 1864.) Compound Tincture of Camphor. Tinct. Opii Camphorata. Camphorated Tincture of Opium. Paregoric Elixir. English Paregoric.

Prep.—B. Macerate together *Camphor*, gr. xxx.; *Opium* in coarse powder, gr. xl.; *Benzoic′*, gr. xl.; *Oil of Anise*, ʒß.; *Proof Spirit*, Oj. for seven days, with occasional agitation. Filter. Add Proof Spirit to make Oj.

Though this preparation is named from Camphor, Opium is its most powerful ingredient; hence it is described in this place. The old name is now restored. It is advantageous, as enabling Opium to be prescribed without the knowledge of the patient. The presence of the stimulants is supposed to counteract the debilitating effects of Opium on the stomach, while the Benzoic acid, determining to the mucous surface of the aërial passages, diminishes profuse secretion, and the Opium quiets troublesome cough by allaying sensibility. Hence it is much employed to relieve the tickling of coughs, and likewise in some diarrhœas. Each f℥ß, or 240 mimims, contains Opium gr. j.

Dose.—fʒß–fʒiv. Frequently added to cough mixtures.

Acetum Opii, having been ordered of very different strengths in the Pharmacopœias, and possessing no particular advantage over other preparations, is omitted in the B. P.

The Black Drop is a celebrated nostrum, in which Opium is boiled with aromatics in verjuice (from the wild crab), sugar is added, and the whole fermented. One drop is considered equal to two or three drops of Laudanum. The above or the salts of Morphia are the best substitutes.

Liquor Opii Sedativus, of Mr Battley, is another secret preparation which has long been esteemed in the profession for its efficacy and its little disagreeable effects as an opiate. It is an aqueous solution of Opium, and resembles Extractum Opii Liquidum, B. P. Mr Cooley states that it contains a Meconate of Morphia combined with extractive and such other matter as is soluble in temperate distilled water, and that we may produce it by the following formula:—

Take *Dry Opium* (Smyrna) in powder, 1 part, *Clean Washed* (silica) *Sand* 2 parts. Mix, and moisten with water, introduce into a percolator, and pass *Aq. dest.* at 65° or 70° F. through the ingredients, until it passes both tasteless and colourless. Evaporate the liquor (by steam or water bath) to the consistence of a *hard pill extract.* Take of this *hard extract* ℥iij. and *Aq. dest.* f℥xxx. Boil for two minutes; let it cool; filter; then add *Rectified Spirit* f℥vj. and *Aq. dest.* q. s. to make up nearly f℥xl. or one quart.

Dose.—♏v.–♏xx. ♏xx. are equal to about ♏xxx. of Laudanum.

Enema Opii, B. Opium Clyster.

Prep.—B. Take *Tincture of Opium* ♏xxx. and *Mucilage of Starch* f℥ij. Mix.

Action. Uses.—Laudanum in this form often relieves many painful affections of the intestinal canal and urinary organs.

Linimentum Opii, B. Liniment of Opium.

Prep.—B. Mix *Soap Liniment* and *Tinct. of Opium*, of each f℥ij. (This and the last are twice as strong as the L. preparations.)

Action. Uses.—The external friction of Laudanum not only relieves local pain, but produces the general soporific effects of Opium.

Emplastrum Opii, B. Plaster of Opium.

Prep.—B. Melt *Resin Plaster* ℥ix. by water bath; add *Opium* in powder ℥j. by degrees, and mix thoroughly.

Action. Uses—Applied to relieve Rheumatic and other pains.

[**Ungentium Opii, L.** Ointment of Opium.

Prep.—Rub *Powdered Opium* gr. xx. with *Lard* ℥j.

This ointment forms a valuable local anodyne for general use.]

Unguentum Gallæ cum Opio, B., is an astringent application which contains Opium gr. xxx. in about ℥j. of the Ointment.

Inc.—Several minerals decompose Opium, and cannot therefore be prescribed with it,—as alkalies in small quantity; but these, when in excess, redissolve the Morphia they have precipitated. Alkaline Carbonates, Lime water, Astringents containing Tannic acid, Sulphates of Zinc, Copper, Iron, and Lead, Nitrate of Silver, Perchloride of Mercury.

Antidotes.—In cases of poisoning by Opium or Laudanum, evacuate the stomach either by means of the stomach-pump, by tickling the throat, or by prescribing such emetics as are at hand, as salt or mustard. The Sulphate of Zinc in large doses is the best emetic. Sometimes Tartar Emetic with Ipecacuanha is resorted to; or, in extreme cases, a solution of 1 gr. of Tartar Emetic may be injected into the veins, taking care that no air enters at the same time. During the whole of this time, the patient should be roused by loud talking, shaking, and making him walk about. Apply the vapours of Ammonia or of Acetic acid to the nostrils. Cold effusions to the head and chest are of great efficacy. Distending the stomach with astringent infusions, as of Cinchona or of Gall-nuts, will assist in decomposing the Opium. When the stomach has been freed of the poison, vegetable acids and venesection are useful; while such stimulants as Carbonate of Ammonia and Brandy and Coffee will be useful in rousing and supporting the patient. Sinapisms and irritants to the feet, &c., ought to be applied; and artificial respiration not neglected.

Among American remedies of the Nat. Ord. Papaveraceæ, there are two which deserve notice, as having obtained some notoriety in this country. *Sanguinaria canadensis*, blood-root, or "Red Puccoon," is an old Indian remedy adopted by the whites who have succeeded the native tribes. The part used is the rhizome, which is imported in small pieces, about 1–2 inches long, half-an-inch in diam., wrinkled, and marked with ridges so as to appear bead-like. The interior is orange-red in colour. It has a bitter, acrid taste, and feebly narcotic odour. The infusion becomes blood-red with SO_3 or HCl. It contains a resin, and an alkaloid called *Sanguinarina*, which is highly poisonous. Sanguinaria is emetic, expectorant, diaphoretic; in large doses, a narcotico-acrid poison. It has been used in every variety of inflammatory disease, and empirically in cancer, in which it is of course of no service.

Dose of the infusion (℥½ in ℥xvi.) ℥ß–℥j.; of the resinous extract prepared in America, "Sanguinarin" gr. $\frac{1}{4}$–gr. 1; of the pure alkaloid Sanguinarina $\frac{1}{30}$–$\frac{1}{10}$ of a grain. (See papers by Dr Gibb and Professor Bentley in P. J., new series, vols. i. and iv.)

The root of *Sarracenia purpurea*, "Indian Cup," or "Indian Pitcher-plant," so called from its peculiar cup-shaped or pitcher-shaped leaves, was introduced into this country as a remedy for small-pox by Mr Miles (*Lancet*, Dec. 7, 1861), who had observed the success of the practice of a squaw of the Mic-Mac tribe in Nova Scotia, who administered this remedy. It occurs in knotted rhizomes of irregular shape, half-an-inch thick, 2–7 in. long, marked with scars where the leaves have fallen off, and bearing at one end the withered remains of a leaf-bud. The preparations of the root are slightly acrid and diuretic, but appear to possess little activity of any kind. Mr Miles and Dr Morris affirm that it is a certain cure and preventive of Variola in every form. The trials of it made by other practitioners have not proved satisfactory. (See various papers and letters in *Pharm. Journ.*, *Lancet*, *Dub. Med. Press.* 1862–3. Also Wood and Bache, *Dispensatory*, 11th ed.)

CRUCIFERÆ, *Juss.* Cressworts.

Cruciferæ are allied to Papaveraceæ and to Capparideæ, and are found chiefly in the temperate parts of the Northern hemisphere, but a few species occur in most parts of the world. They abound in mucilaginous, and the roots of some in saccharine principles. A fatty oil is stored up in the seeds of many. Sulphur is contained in some, and nearly all abound in an acrid principle, which makes them useful as Condiments, Rubefacients, and Stimulants.

Cochlearia officinalis, or Scurvy-grass, which was long esteemed as an antiscorbutic, and *Cardamine pratensis*, or Cuckoo-flower, the flowers of which were supposed to be stimulant, are both natives of England, but are now no longer officinal.

ARMORACIÆ RADIX, B. The Fresh Root. Cochlearia Armoracea, *Linn.* Horse-radish. *Fr.* Cran de Bretagne.

This plant is supposed by some to be the *wild radish* of Dioscorides and the Armoracia of Pliny. It seems to have been first clearly recognised by Brunsfels in 1530. It is a native of most hilly situations in Europe, and is much cultivated in this country, flowering in May.

Bot. Ch. Root perennial, long, white, and tapering, pungently acrid, throwing up large pedunculate leaves, which are lanceolate crenate, smooth, deep green, much veined, and somewhat resembling those of the Water Dock. From the midst of these rise erect stems, 2 or 3 feet high, furrowed and branched towards the top. Stem-leaves small, sessile, the lower ones with the margin much cut, the upper lanceolate, toothed. Inflorescence a raceme. Calyx spreading, equal at base. Petals white, obovate, entire. Filaments not toothed, straight above. Silicle ovate, valves very convex. Dissepiment thin, but broad. Seeds numerous, cotyledons accumbent. The silicles differ from those of Scurvy-grass in wanting the dorsal nerve; they are inflated, almost globose, but often abortive. By Wattereau and others it has been separated from Cochlearia (on account of the valves of the silique being without a dorsal nerve), and formed into a new genus ARMORACIA, with the specific name of *A. rusticana.*

The fresh root, which is alone officinal, is thick and long, fleshy and white, emitting when scraped a pungent diffusible odour, and imparting a hot and acrid taste, with some sweetness. Its virtues depend upon a volatile oil, which is dissipated by drying, and also by heat. Hence the root is usually used as a condiment in its fresh state. A little of the activity is communicated to water, but most completely to alcohol. Dr Duncan states that the oil is in proportion of four parts in a thousand; Gutret has found much less. The oil is of a light yellow colour, heavier than water, very volatile. It tastes at first sweetish, soon becomes acrid and burning, inflaming the lips and tongue. It will produce vesication when applied to the skin. The watery solution precipitates Acetate of Lead brown, and Nitrate of Silver black—that is, forms Sulphates of these metals, showing that the oil contains Sulphur. The other constituents of the root are Bitter Resin, Extractive, Sugar, Gum, Starch, Albumen Lignin, and Salts.

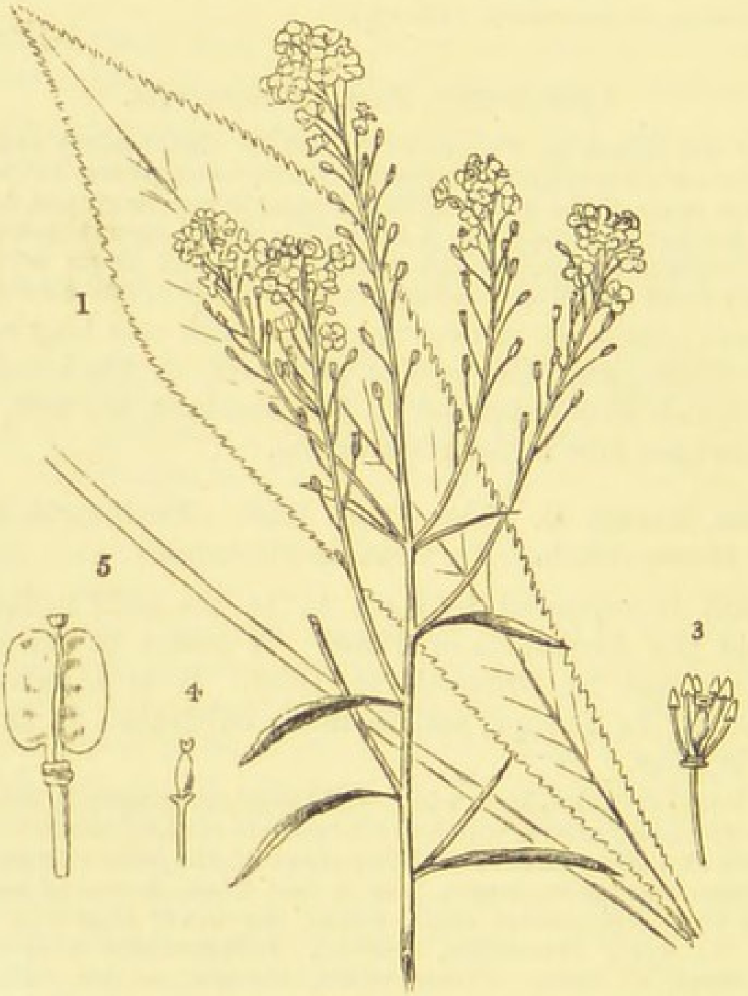

Fig. 42.*

(The root of Aconite has been mistaken for it, but the roots of Horse-radish are larger, longer, and seldom in clusters.)

Action. Uses.—Externally. Rubefacient, Vesicant, Irritant. *Internally.* Stimulant, Masticatory, Diuretic. An infusion was ordered in the L. P.

SPIRITUS ARMORACIÆ COMPOSITUS, B.

Prep.—Mix together *Horse-radish* scraped, *Bitter Orange-peel* cut small and bruised, āā ℥xx.; *Nutmegs* bruised, ℥ß; *Proof Spirit*, Cj.; *Water*, Oij., and let a gallon of fluid distil over with a moderate heat.

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* 1. Leaf. 2. Raceme. 3. Flower, with the Calyx and Corolla removed 4. Pistil. 5. Silicule.—E. B. t. 2223.

Action. Uses.—Stimulant adjunct, especially to Diuretic infusions. *Dose.*—f℥j.–f℥iv.

SINAPIS, B. Sinapis nigra and S. alba, *Linn.* The seeds, mixed, or reduced to powder. Black and White Mustard. *Tetradynamia Siliquosa*, Linn.

Common Mustard consists of the flour of the seeds of the Black Mustard, generally mixed with that procured from the seeds of the White Mustard, or *Sinapis alba*, and deprived of fixed oil by expression. Both species have been long used in medicine, being the ναπυ of Hippocrates, and the Sinapi of the Romans. The Black Mustard is indigenous in almost every part of Europe. So also is the White Mustard, which, possessing nearly the same properties, may also have been employed by the Greeks.

Bot. Ch. S. NIGRA.—The root is thick and fleshy, the stem about 2 to 3 or 4 feet high, hispid below, with smooth round branches above. Lower leaves large, rough, lyrate, variously lobed and toothed; upper ones narrow, lanceolate, smooth, dependent. Calyx yellowish, equal at base, spreading. Petals obovate, yellow, spreading. Silique small, erect, or placed close to the stem, obtusely quadrangular, nearly even and smooth, tipped by a short quadrangular style, but without the proper, often seed-bearing beak of the genus; the valves convex, with one straight dorsal nerve, and a few lateral anastomosing veins. Seeds numerous, in a single row, small, round, blackish-brown. Fig. 43.—E. B. t. 969.

S. ALBA. Root tapering, small. The stem 1–2 feet or more high, round, smooth, or slightly hairy. Leaves lyrate, irregularly lobed or pinnatifid, roughish. Sepals linear, green, horizontal. Flowers large, yellow. Silique hispid, spreading on nearly horizontal stalks, short, tumid or knotty from the prominent seeds, shorter than the sword-shaped beak; valves with 5 straight strong nerves. Seeds few on each side, large and roundish, pale yellow coloured, having in the interior a yellow mass, which is covered by a thin pellicle of what must be composed of condensed mucilage. Fig. 44.—E. B. t. 1677.

The Black Mustard only was mentioned in the P. L. of 1836. The Seeds of *Sinapis arvensis*, Charlock, or Wild Mustard, are sometimes found among Mustard seeds. The pods of this plant, like those of *S. alba*, have a long sword-shaped beak; and each of the valves is three-nerved, those of *S. alba* being five-nerved. Black Mustard, having neither the beak nor the nerves, has been removed to the genus Brassica by Koch and other botanists.

The Mustard plants are officinal on account of their seeds, or rather of the flour of these seeds, so well known as a condiment by the name of Mustard. Dr Pereira states that the best flour of Mustard is prepared by crushing the seeds of both Black and White Mustard between rollers, and then pounding them in mortars, when they are twice sifted to yield *pure flour of Mustard.* Dr Christison's information confirms that of Dr Pereira, that common flour of Mustard is adulterated, partly on account of the pungency of Black Mustard seed. "Two bushels of black and three of white seed yield, when ground, 145 pounds of flour; which, to diminish the pungency and improve the colour, is mixed with 56 pounds of wheat flour and two pounds of turmeric; and the acrimony is restored without the pungency, by the addition of a pound of (capsicum) chilly pods, and half-a-pound of ginger." (*c.*) The *pure flour* of Mustard ought alone to be used officinally.

Though Black and White Mustard have both been minutely examined by several chemists, they still require further investigation. The former contains a fixed Oil, Gummy matter, Sugar, a Colouring and a peculiar green matter, a Fatty pearly matter; *Myronic acid* in combination with *Potash*, or Myronate of Potash, *Myrosin*, *Sinapisin*, and some salts. The fixed oil of Mustard forms 28 per cent. It is mild in taste, with little odour, of a yellow colour, Sp. Gr. 0·917, thicker than olive oil, does not readily become rancid, makes an excellent soap, is sometimes used instead of rape oil, and has been employed as a purgative. (*Bussy.*)* *Sinapisin* of Simon is in white, brilliant, micaceous, and volatile crystals, soluble in alcohol, ether, and oils, insoluble in acids and alkalies. *Myrosin* is a substance analogous to vegetable albumen or the emulsion of bitter

Fig. 43.

Fig. 44.

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* In this oil, as well as in the fixed oil obtained from White Mustard seed, Mr St Darby has discovered a new fatty acid, which he has named Erucic acid. It melts at 93° Fahr., and has the formula $C_{44}H_{42}O_4$. (P. J. ix. 83.)

almonds. *Myronic acid*, composed of Carbon, Hydrogen, Oxygen, Nitrogen, and Sulphur, is bitter, without odour, uncrystallisable, and may be separated in an impure state by alcohol, when the fixed oil has already been removed by expression or by ether.

It is curious that we do not find among the above products the acrid principle for which Mustard is so remarkable. In fact, it is not contained in the seeds; the acrimony is due to what is called *Volatile Oil of Mustard*, which is the result of the action of some of the constituents of the seed on one another, when water is added under 200° F. Bussy is of opinion that the Myronic acid, on the contact of Myrosin and water, yields the volatile oil of Mustard. When flour of Mustard is exposed to dry heat, or acted upon by alcohol, no acridity is observed; but if water be added first, the pure volatile oil is obtained, which may be separated by distillation. The mineral acids check the formation of this volatile oil, so does the Carbonate of Potash, and also the vegetable acids when they are of the Sp. Gr. of at least 1022; though when once formed, the acids have no influence in preventing its effects.

The Volatile Oil of Mustard is white or of a lemon colour, extremely acrid and pungent, and exciting the secretion of tears. Sp. Gr. at 68° F. 1·015, boiling at 290° F. Soluble in alcohol and ether; slightly in water, and separated from it with difficulty, in consequence of having nearly the same Sp. Gr. With Ammonia it forms a crystalline compound (Thiosinnamine), in which the oil of Mustard is destroyed. Sesquichloride of Iron produces an orange tint in infusion of Black Mustard seed. The oil consists of $C_8H_5N\,S_2$. Berthelot has succeeded in producing it by an artificial process.*

White Mustard seeds yield about 36 per cent. of fixed oil, and when macerated in water, yield a thick, mucilaginous, almost insipid liquor, whilst Black Mustard seed give little mucilage, but a pungent taste to the water. According to the analysis of John, these seeds contain—1. An acrid volatile oil. 2. A yellow fixed oil. 3. Brown resin. 4. A very little extractive. 5. A little gum. 6. Lignin. 7. Albumen. 8. Phosphoric acid and salts. Henry and Garot ascertained the presence of *Sulphosinapisin*,—a name which Berzelius has contracted into Sinapin. This is white and light, without odour, at first bitter in taste, but then like mustard; soluble in water, alcohol, and ether, and crystallisable. It consists of C 57·92, H 7·79, N 4·9, O 19·68, and of Sulphur 9·65. "Acted on by acids, oxides, and salts, readily yields Sulphocyanic acid" (*p.*), which strikes a red colour with the persalts, as for instance the Sesquichlor. Iron, and produces a white precipitate in a solution of Sulphate of Copper containing Iron. White Mustard does not furnish volatile oil; but, in certain circumstances similar to those with Black Mustard seed, a fixed acrid principle is produced, which, like the volatile oil of Black Mustard, did not previously exist.

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* By acting upon *Glycerine* with Iodide of Phosphorus, and heating the product ($C_6\,H_5\,I$) in a close vessel with Sulphocyanide of Potassium.—*Journ. de Pharm.*

The *fixed acrid principle* is an unctuous liquid of a reddish colour, without odour, but having a biting acrid taste, analogous to that of Horse-radish root. It contains Sulphur. M. Faure states that this same principle is formed in small quantity when Black Mustard is treated with water. *Erucin,* which does not redden the salts of Iron, and contains no Sulphur, is another principle found by Simon.

Tests.—As the common flour of Mustard is that usually employed, we generally make use of adulterations along with the true flour. But as Mustard-flour is sometimes exhibited internally, it is desirable to have it in a pure form. The adulteration with wheat-flour can be easily detected by the following test—A decoction allowed to cool is not turned blue by tincture of Iodine.

Action. Uses.—Powerfully acrid and pungent. The seeds of the White Mustard, taken in an entire state, have their mucilaginous covering dissolved away by the juices of the stomach, and will then act as stimulants. Two or three spoonfuls used to be given two or three times a-day in Dyspepsia. The uses of Mustard as a condiment, and of the young herb as a salad, are well known. It is Stimulant; Diuretic, in the form of Mustard Whey. Externally Rubefacient, &c. Much used in the form of Mustard Poultice. (q. v.) Emetic in doses of a tea-spoonful to a table-spoonful in half-a-pint of water.

CATAPLASMA SINAPIS, B. Mustard Poultice or Sinapism.

Prep.—Take of *Powdered Mustard* and *Linseed Meal* āā ℥ijß, or q. s.. Mix the latter gradually with *Boiling water*, f ℥x., and add the *Mustard*, constantly stirring.

Pure Mustard should be used; as common Mustard-flour is weakened by the addition of wheat-flour. It may also be made with bread-crumb, or the Mustard flour may be spread on a poultice. Vinegar used to be ordered; but except where the Mustard is adulterated with Capsicum, it is worse than useless, as it prevents the formation of the acrid volatile oil. Messrs Trousseau and Pidoux found boiling water unnecessary, as a cold poultice produces the same effect as a hot one, but takes a little longer time to produce its effect.

Cooper's *Sinapine Tissue* or *Mustard Paper*, recommended in the same cases as mustard poultice, appears to be prepared with an alcoholic solution of the fixed acid principle.

OLEUM SINAPIS, B. Oil of Mustard.

The volatile Oil is distilled with water from the seeds of Black Mustard, *Sinapis nigra*, Linn., after the expression of the fixed oil. It is colourless or pale yellow. Specific gravity 1·015. It dissolves readily in Alcohol and Ether, and to a slight extent in water. It has an intensely penetrating odour and a very acrid burning taste. Applied to the skin it produces almost instant vesication. It is a powerful rubefacient and vesicatory, in the proportion of 1 part to 20 of proof spirit. It is used in B. P., 1867, to make the following.

LINIMENTUM SINAPIS COMPOSITUM, B. Compound Liniment of Mustard.

Prep.—Take of *Oil of Mustard*, f ʒj.; *Ethereal Extract of Mezereon*, gr. xl. *Camphor*, gr. cxx.; *Castor Oil*, f ʒv.; *Rectified Spirit*, f ℥iv. Dissolve the extract of Mezereon and Camphor in the spirit, and add the Oil of Mustard and Castor Oil.

Introduced in 1867. An excellent rubefacient application for chronic rheumatism, pains in the chest or belly.

VIOLACEÆ, *Juss.*

The herbaceous species inhabit the temperate parts of the Northern, a few the Southern hemisphere, and within the tropics. The shrubby species grow in South America and India. The stems and leaves are mucilaginous, and contain Violine, which is similar in its nature and effects to Emetine. This has also been found in some of the shrubby species of Ionidium. Several of them (see Martius's Spec. Mat. Med. Braziliensis) are employed as Substitutes for Ipecacuanha. The roots of *Ionidium Ipecacuanha* are the *false Ipecacuanha of Brazil*, and yielded Pelletier 5 per cent. of Emetine. Cuchunchully de Cuença, the roots of *Ionidium microphyllum*, are similar in properties. There are specimens in the Museum of K. C. from the Hon. Fox Strangways.

[VIOLA, L. Viola odorata, *Linn.* Petalum recens. The Flowers. The March or Sweet Violet. *Pentand. Monog.*, Linn.

This, the ιον of the Greeks, is found wild on the borders of fields, in shady situations in many parts of Europe, but is cultivated on account of its flowers, which are so much esteemed for their agreeable odour and colour.

Bot. Ch.—The plants are stemless, but give out runners. The leaves are broadly cordate, pubescent. Sepals obtuse, the lowest petal emarginate, the four upper ones roundish obtuse, a little narrower. Stigma hooked, naked. The fruit-bearing peduncles prostrate, straight at the apex.

The flowers should be gathered soon after they have blown. The colour may be retained for some time if they are carefully dried, but for a still longer period if preserved in syrup. As the violet or purple colour is changed into red by acids, and green by alkalies, it is often employed as a test.

Action. Uses.—The expressed juice and the syrup are slightly laxative; and hence, besides being employed on account of its odour and colour, the Syrup is prescribed as a laxative for young, especially new-born children, with an equal quantity of almond oil, in doses of one or two tea-spoonfuls.

Violets, and other species, as *V. tricolor*, have also been employed as demulcent expectorants on the Continent. The seeds are stated to be purgative and emetic by Bichat, &c., as are also the roots. Viola is not officinal in the B. P.

SYRUPUS VIOLÆ, L. Syrup of Violets.

Prep.—L. Macerate *Fresh Violet Petals* ℥ix. in *Boiling Dist. water* Oj. for 12 hours, then press and strain; set aside, that the dregs may subside; add *Sugar* ℔iij. or q. s., dissolving with a gentle heat; and, when cool, add to each f℥j. *Rectified Spirit* fʒß.

This Syrup has a light-blue colour, an agreeable taste, and an odour of the flower. Sp. Gr. 1·33. That sold in the shops is frequently sophisticated. Syrup of Pansies is substituted for it. Indigo in powder, Sulph. Indigo, the colours of the Red Cabbage and the Red Poppy, are employed to imitate it. Out of 12 samples purchased and examined by Mr Kendall, not one was genuine. (P. J. xiii. 19.)]

POLYGALEÆ, *Juss.*

The Polygaleæ are found in the temperate and warm regions of the whole world. Many of the species abound in bitter principle, as *P. vulgaris* and *P. amara;* others secrete a peculiar principle, which has been called Polygaline. Several species are official in Brazil and India.

SENEGÆ RADIX, B. Polygala Senega, *Linn.* The dried root. Seneka Snake Root.

This root was introduced into practice in 1735, by Dr Tennant, of Virginia, who learnt from the Senagaroo Indians that they employed it as an antidote against the bite of the rattle-snake. It is a native of the United States of America, chiefly in the southern and western sections, where the roots are collected in large quantities.

Fig. 45.

The plant (fig. 45) is small, with a perennial branched root, from which arise several erect annual stems, smooth, simple, round and leafy, which are occasionally tinged with red in their lower portion. The leaves are sessile, alternate, oblong, lanceolate, of a bright green on the upper surface. The flowers are small, arranged in terminal spikes. Sepals 5, two of which are large, wing-like, and white. Petals 3, small, closed, with a beardless keel. Capsule elliptical, emarginate, covered by the persistent sepals. (Barton Am. Med. Bot. 11, t. 36.) Fig. 45.—1. Sepals spread out with the petals adpressed against each other. 2. Central Petal or Keel with the Stamens adhering. 3. A Seed.

Seneka roots are brought to market in bales of from 50 to 400 pounds: the pieces vary in thickness from a small quill to that of the little finger; head knotty, exhibiting marks of former stems, branched, twisted, with a projecting keel-like line along its whole length; bark-like part is corrugated, cracked, of a yellowish-brown colour in the young roots, and brownish-grey in the old, resinous, and contains the active principle; the central portion, or meditullium, is woody, white, and quite inert. (Goebel and K. ii. t. xx. f. 1.) The odour is peculiar, strong in the fresh root (Wood and B.); taste at first mild, becomes bitter and acrid, exciting irritation in the fauces and a secretion of saliva. Seneka has been analysed by various chemists: the latest, Quevenne, finds Polygalic, Virgineic, Tannic, and Pectic acids, Wax, Fixed oil, yellow Colouring matter, Gum, Albumen, Woody fibre, and various Salts. The *Polygalic acid*, Senegine of Gehlen, and Polygaline of others, is solid, brownish-coloured, white when pure, translucent, without odour, and at first insipid, but soon excites sneezing when powdered, and a disagreeable taste in the mouth with constriction in the fauces. It is insoluble in ether and oils, partially soluble in water, but readily in alcohol. Given in doses of 6 or 8 grains to dogs, it has been known to cause vomiting, difficulty of breathing, and death in three hours.

Action. Uses.—Seneka, as indicated by its acrid taste, is possessed of Stimulant properties; it increases many of the secretions, acting as a Sialogogue, Expectorant, Diaphoretic, Diuretic, and Emmenagogue; and, in large doses, it is Emetic and Cathartic. It is chiefly useful in coughs.

The roots of *Panax quinquefolium*, or Ginseng, are sometimes mixed with the Seneka.

Dose.—Of the powder, gr. x.–gr. xx. But the decoction (or infusion) is the best form of exhibition.

INFUSUM SENEGÆ, B. Infusion of Seneka Root.

Prep.—Senega bruised, ℥ß; *Boiling Dist. water*, ℥x.

Dose.—f℥j. to f℥iij. 3 or 4 times a-day.

TINCTURA SENEGÆ, B. Tincture of Senega.

Prep.—Senega bruised, ℥ijß; *Proof Spirit*, Oj. Prepared as Tinct. Aconiti.

Dose.—ʒj.–ʒiij.

The U. S. P. has a Syrup of Seneka root, and it forms an ingredient in the Mel Scillæ compositum.

KRAMERIACEÆ, *Lindl.*

KRAMERIÆ RADIX, B. The root, dried. Krameria triandra, *Ruiz and Pavon.* Rhatany.

The Rhatany Plant is a native of Peru, growing on the slopes of sandy mountains, especially near Huanuco, where it was discovered in 1779 by Ruiz, who found that the root was employed by the ladies for rubbing the teeth and strengthening the gums.

The shrub is small but much branched, with the younger parts covered with silky hairs. The stems procumbent, and the roots horizontal or creeping, as said to be indicated in the name Rhatania. These roots are long, much-branched, with a dark reddish bark. The leaves are sessile, oblong-ovate, pointed, and silky. The flowers are solitary, in the axils of the upper leaves, with short stalks. The calyx consists of 4 spreading sepals, silky externally, but smooth, shining and lake-coloured in the inside, though this is not visible in dried specimens. Petals 5, unequal (the two upper petals separate, spathulate; two lateral roundish, concave, *Lindl.*) three anterior clawed, with the claws united, limbs small, sometimes abortive, the two posterior sessile, thickish. Stamens 3, anthers opening by a double pore of the apex. The fruit is globular, leathery, indehiscent, about the size of a pea, covered with reddish-brown hooked prickles; one-celled, with one seed, the other being abortive. Seed inverse, suspended, without albumen.—Fl. Peruv. 1, t. 93.

Rhatany root is woody and branched; the pieces vary in diameter from an inch to that of a quill; the cortical part is reddish-brown, fibrous, and easily separated from the central, reddish-yellow, woody part. The root is without smell, but has an extremely astringent taste without any bitterness. It tinges the saliva red. The cortical portion contains a much larger portion of the active principle than the interior; the smaller pieces, from the greater proportion of bark, are the most efficacious. (G. and K. ii. tab. iv. fig. 2.) Besides the root, an extract is sometimes imported from S. America.

Rhatany Root consists of one-third of matters soluble in water. These consist of Tannin 42·6, Gallic acid 0·3, Gum, Extractive, and Colouring matter, 56·6, and Krameric acid 0·5. The properties are no doubt in a great measure due to the Tannin, and, according to Peschier, to the Krameric acid also, which he describes as being very styptic, not crystallisable, but forming with the alkalies salts which do crystallise. M. Chevallier, on repeating the experiment, was unable to procure any of the acid. Water and Alcohol both take up the active properties, and become of a reddish colour.

Inc.—The salts of Iron and other metals, Gelatine, mineral acids Inf. Cinchonæ, Potassio-Tartrate of Antimony.

Action. Uses.—Astringent, Tonic.

Dose.—Powder, gr. x.–gr. xxx.

EXTRACTUM KRAMERIÆ, B. Extract of Rhatany.

Prep.—Macerate *Rhatany* in coarse powder ℔j. in a pint and a-half of *Dist. water* for twenty-four hours; then pack in a percolator, and add more Distilled water, until twelve pints have been collected, or the Rhatany is exhausted. Evaporate the liquor by a water bath to dryness.

Dose.—Gr. x.–gr. xx.

Has a reddish-brown colour, and, when dry, a vitreous and shining fracture, and yields a blood-red powder, bearing a close resemblance to Kino. That imported from S. America used to be, and perhaps still is, employed for adulterating port wine.

INFUSUM KRAMERIÆ, B. Infusion of Rhatany.

Prep.—B. Macerate *Krameria* ℥ß in boiling distilled *Aq.* ℥x. for one hour in a covered vessel, and strain.

Dose.—f℥jß–f℥ij. twice or thrice a-day. The decoction is also a good form for exhibition. Astringent taste, and of a reddish colour.

TINCTURA KRAMERIÆ, B. Tincture of Rhatany.

Prep.—*Rhatany*, in coarse powder, ℥ijß; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Dose.—ʒj.–ʒiij.

In the United States a compound Tincture is prepared, with powdered root ℥iij.; Orange Peel, ℥ij.; Serpentaria, ℥ß; Saffron, ʒj.; in Proof Spirit, Oj. It is a grateful astringent.

LINEÆ, *Dec.* Flaxworts.

They are found in temperate parts of the world, with a few in tropical regions. The Lineæ are remarkable for the tenacity of the fibre of their inner bark, also for the mucilaginous covering of the seed, and for the oil contained in the seeds. Some are bitter, and a few purgative.

LINUM USITATISSIMUM, *Linn.* Flax. *Pentand. Pentagyn.*, Linn. Semina, B. Linseed. Flax-seed. Farina, B. Linseed Meal. Oleum, B. Linseed Oil.

Flax was cultivated in Egypt at very early periods. It is so at the present day from the north of Europe to the south of India; and it is not, therefore, easy to ascertain where it is indigenous.

The Flax plant is an annual, with a slender root, small, simple, erect stem about a foot and a-half in height and branched towards the top. The leaves are alternate, sessile, linear, lanceolate, smooth. The flowers, of a blue colour, are arranged in a corymbose panicle. The sepals are ovate, acuminate, slightly ciliated, but without glands, nearly equal to the capsule in length. The petals are obscurely crenate, of a purplish blue, large, deciduous. Capsule roundish, about the size of a pea, containing 10 seeds (*linseed*) small, oval, flattened, smooth, and shining, of a brown colour, but whitish in the inside; the seed-coat mucilaginous, the kernel oily and farinaceous.—E. B. 1357.

Flax, as it is well known, is prepared from the above plant, by steeping, stripping off the bark, and then beating, so as to separate the fibres. Linen and cambric are prepared from it, the latter differing from the former in its fineness, and in being obtained from plants which are more thickly sown. Linen, as clothing, is cool, from being a better conductor of heat than cotton; but when the skin is covered with perspiration, or exposed to cold, it feels cold and chilly. The fibre of flax is a straight tube-like cylinder, and is therefore less irritating than the twisted fibre of cotton. Hence lint, which is prepared by scraping linen, is so much preferable to cotton for surgical dressings. Tow consists of the short fibres of the flax, which are removed in the process of hackling. It is used for a variety of purposes.

LINI SEMINA, B. Linseed, or the seeds of the flax plant, are small, compressed, oval-pointed, with sharp margin, brownish-coloured, smooth and shining on the outside, but white internally, without odour. The outside has a bland mucilaginous taste, as the skin of the seed is covered with condensed mucus ; the white part, or almond of the seed, has an oily taste, from containing fixed oil, which is separated by expression.

The seeds, analysed by Meyer, consist, in 100 parts, of 15·12 Mucilage (nitrogenous mucilage with acetic acid and salts, *p.*), chiefly in the seed-coat, 11·26 fatty Oil in the nucleus. In the *husk* Emulsin 44·38, besides Wax 0·14, acrid soft Resin 2·48, Starch with Salts 1·48. In the *nucleus*, besides the Oil, Gum 6·15, Albumen 2·78, Gluten 2·93, also Resinous colouring matter, 0·55, yellow Extractive with Tannin and Salts (nitre and the chlorides of potassium and calcium) 1·91, sweet Extractive with Malic acid and some Salts 10·88.

The condensed mucus which abounds in the testa of the seed is readily acted on by hot water, and a viscid mucilaginous fluid is formed, in which are two distinct substances, one completely dissolved, analogous to gum (Arabine), and the other merely suspended, and considered by Berzelius as analogous to Bassorine. Alcohol produces a white flaky precipitate in mucilage of Linseed, and Acetate of Lead a dense precipitate.

Action. Uses.—Emollient, Demulcent ; may be employed in the form of infusion.

INFUSUM LINI, B. Infusum Lini compositum, L.

Prep.—Infuse *Linseed* gr. clx., *Fresh Liquorice Root*, sliced, gr. lx., *Boiling Dist. water* ℥x. in a covered vessel for four hours, and strain through calico.

A simple infusion may be formed by merely steeping half-an-ounce of the seeds in a pint of boiling water, and rendering it more palatable by the addition of sugar and some aromatics, as mint, lemon-peel, &c. The decoction is more suitable for fomentation and enemata, as it separates more of the oil, but is on this very account less agreeable for internal use.

Dose.—f℥jſs ad libitum. In coughs, &c.

Inc.—Alcohol and metallic salts.

OLEUM LINI, B. Linseed Oil. (Expressed without heat.)

The oil contained in the kernel of the seeds, and obtained from them by expression, may be either cold-drawn, or, as usually obtained, after the seeds have been subjected to a heat of 200°. The former as in the case of cold-drawn castor oil, is paler, with less odour, and taste, than Linseed oil prepared by heat. This is of a deep yellow or brownish colour, of a disagreeable smell and taste; Sp. Gr. 0·932; soluble in alcohol and ether, differing from other oils especially in the property of drying into a hard transparent varnish, —a peculiarity which is increased by boiling the oil, either alone, or with some of the preparations of Lead.

Both Linseed and Hempseed oils turn green with $S\,O_3$ of Sp. Gr. 1·47. They may thus be detected when employed to adulterate other oils. Another test serves to distinguish the one from the other. With $N\,O_5$ of Sp. Gr. 1·18 Hempseed oil alone becomes green. 10 per cent. of it in Linseed oil may be discovered in this way. (Crace Calvert.)

Linseed oil, according to Dr Sace, is composed of Margarine and Oleine in nearly equal equivalents. But the Oleic acid of Linseed differs from that of other fatty bodies. The formula of the anhydrous acid is $C_{46}\,H_{38}\,O_5$. The Margaric′ is as usual composed of $C_{34}\,H_{33}\,O_3$. The Glycerine obtainable from Linseed oil in large quantities is also similar to that procured from other fats.

Action. Uses.—Emollient and Cathartic. Chiefly used externally. (*See* Linimentum Calcis.)

Dose.—fʒiv.–f℥j. as cathartic.

FARINA LINI, B. Linseed Meal.

Linseed, after having had the oil expressed from them, are in the form of a flat mass, commonly called *oil-cake.* This being reduced to powder, forms Linseed Meal, which is employed for making the Linseed Meal Poultice.

CATAPLASMA LINI, B. Linseed Poultice.

Prep.—Mix *Linseed Meal*, ℥iv. with *Olive Oil* ℥ß. Add *Boiling water*, ℥x., gradually, constantly stirring.

Here the oleaginous and mucilaginous materials being mixed up together, and the properties of the latter elicited by the hot water, an admirable mixture is produced for making an excellent and readily made emollient poultice. (If powdered Linseed is used the Olive Oil is unnecessary.)

The Linseed Meal sold in France has been found adulterated with some refuse oil seed powder, mixed frequently with a little bran, oatmeal, and almond powder, with the refuse of starch manufactories, and often some rancid oil.

Linum catharticum (Purging Flax), is a small inconspicuous plant which grows plentifully on dry heaths throughout Britain. It has long enjoyed the reputation of a popular purgative, but is not now officinal.

MALVACEÆ, *Brown.* Mallow Worts.

From the name this might be supposed to be a European family, but the species abound in the tropics both as trees and herbs, and diminish in number and size as they approach the poles. The species (about 600 in number) are almost all mucilaginous, and yield tenacious fibre. A few are employed as articles of diet.

[MALVA. Malva sylvestris, *Linn.* The common Mallow. *Monadelphia Polyandria*, Linn.

The Mallow is found in most parts of Europe, by hedges, roads, and in waste places, flowering from June to August. It is the Μαλαχη κηπευτή of Dioscorides. It is not now officinal.

The root is perennial and branched. The stem erect or ascending, branched, the petioles and peduncles hirsute; leaves 5 to 7 lobed, plaited and with serrated margins, acute, peduncles axillary, crowded, and erect, even after flowering. Calyx usually surrounded by three narrow bracteoles, and much smaller than the petals, which are rose-coloured and purple-veined; the valves of the carpels margined, reticulated and rugose when ripe.—E. B. t. 671.

Prop.—Common Mallow, like the round-leaved and other species, is without odour, but has a mild mucilaginous taste, imparting this property to water, which dissolves the mucilage, its chief constituent, along with a small portion of bitter extractive. Either this or *M. rotundifolia* was employed as an esculent vegetable by the Romans.

Action. Uses—Demulcent. Its infusion sweetened with Sugar may form a useful drink in some complaints. The decoction may be similarly employed, either for fomentation or injection, or the herb may be formed into an emollient cataplasm.]

[ALTHÆA, L. Althæa officinalis, *Linn.* Radix. The root. Marshmallow. *Monadelphia Polyand.* Linn.

This plant (fig. 46) is found in marshy situations in this country and on the Continent, and is the Αλθαια of Dioscorides, the Guimauve of the French. It is seldom employed in England, and is omitted in the B. P.

The root is perennial, tap-shaped, whitish, and the stems erect, soft, and hairy. The leaves soft and woolly on both sides, unequally crenate, cordate or ovate in shape, the lower 5 and the upper 3 lobed; peduncles axillary, many-flowered, much shorter than the leaf. Flowers of a pale-bluish colour. Calyx double, the exterior (v. 4) involucel 6 to 9 cleft, the (3) interior 5 fid. Stamens (2) numerous, filaments united into a tube. Styles (1) numerous, united together near the base. Carpels arranged as in Malva.—E. B. t. 147.

Prop.—Marsh-mallow roots, as usually seen, are whitish, being deprived of their epidermis; outside they are naturally of a dirty yellow colour, but white on the inside, long, fusiform, fleshy, and, like the leaves, without odour, but having a bland, mucilaginous, or rather a viscous taste.

Chem.—Marsh-mallow roots analysed, yielded to Buchner Mucilage and Starch in large proportions; hence Iodine strikes with them a blue colour; and the Sesquichloride of Iron forms in the decoction a brown semitransparent mass (*p.*); they contain *Altheine*, first discovered by M. Bacon, and since ascertained by M. Plisson to be identical with Asparagine, which is crystalline, without odour, and nearly tasteless, soluble in water and in proof Spirit, but insoluble in Alcohol and Ether.

Action. Uses.—Demulcent, Emollient. Used in the form of Decoction, Syrup, and Lozenge.

Fig. 46.

SYRUPUS ALTHÆÆ, L. Syrup of Marsh-mallow.

Prep.—Macerate *Marsh-mallow Root*, dried and sliced, ℥jß in (cold) *Dist. water* Oj. for twelve hours. Press out the liquor, and strain through linen. Then add *Sugar* ℔iij., or twice the weight of the strained liquid, and dissolve with a gentle heat. Lastly, when the syrup has cooled, add *Rectified Spirit* fʒß to each f℥j.

Dose.—fʒj.–fʒiv. Chiefly added to mixtures to allay irritation of cough.]

GOSSYPIUM, B. Cotton. Cotton Wool. The Hairs attached to the Seeds of *Gossypium herbaceum* and other species of the genus (carded).

Cotton has been characteristic of India from the earliest times. The first distinct notice of it is in the Book of Esther, i. 6, where its Sanscrit name *Karpas* is translated *green* in our Bible. Herodotus and Ctesias notice it; but it was not till the invasion of India by Alexander that the Greeks were acquainted with the plant, as may be seen in Theophrastus, and also in Pliny. Europe, until lately, has been supplied chiefly from America, where two distinct species are indigenous: *G. barbadense*, yielding the Cotton from the United States, and *G. peruvianum* or *acuminatum*, that which is produced in South America. India also has two distinct species, *G. herbaceum* or *indicum*, the common Cotton of India, which has spread to the south of Europe, and *G. arboreum*, or Tree Cotton, which yields little, if any, of the cotton of commerce. (This is very distinct from the species of Bombax often called Cotton tree and Silk Cotton tree.) The cultivation of Cotton in India has been largely increased in consequence of the American civil war.

The species consist of large or small shrubs, and one forms a tree. All have alternate leaves, which are more or less palmate or lobed, and usually covered, as well as the young branches, with little black dots, and the nerves below have one or more glands. The calyx is double; the exterior involucel is larger than the interior, divided into three large leaflets, cordate at the base, entire, toothed, or deeply cut along the margin. The interior or true calyx is one-leafed, cup-shaped, and with an obtusely quinquified margin. The flowers are large and showy, more or less yellow or red, consisting of five petals united at their base, subcordate, flat, and spreading. Stamens numerous, filaments united below and adhering to the petals, free above, with small kidney-shaped anthers. Ovary superior, oval, roundish or pointed, terminated by a style, which passes through the cylinder formed by the stamens, marked with three or five furrows towards its apex, and dividing into three, sometimes into five stigmas. The capsule is roundish, oval or pointed, three to five celled, and three to five valved at the apex with loculicidal dehiscence. Each cell contains from 3 to 7 ovoid seeds, from the seed-coats of which arise the filamentous substance, which by its twisting envelopes the seeds. Along with this Cotton there is often a shorter covering, called *fuzz* by planters.

Action. Uses.—Cotton plants are mucilaginous, and have been used as Demulcents. The seeds yield Oil, which is sometimes expressed for burning in lamps. Cattle are, however, often feed on the seeds, which are also sometimes employed as manure for Cotton plants. The wool of the seeds consists chemically of *Lignine* or *Cellulose*, comp. ($C_{12} H_{10} O_{10}$.) Cotton wool is formed of tubular hairs, which in drying become flattened; they are transparent, without joints, and twisted like a corkscrew. Under water they appear like distinct, flat, narrow ribands, with occasionally a transverse line, which indicates the end of a cell. This twisted nature of the Cotton fibre is probably the reason why Cotton cloth is not so well fitted as linen for surgical dressings. But being a worse conductor of heat than linen, it is well suited for inner clothing, where the object is to preserve uniformity of temperature, as it will retain heat, and prevent the body from being so readily affected by external heat, or cold. At the same time that it condenses less freely than linen the vapour of perspiration, it absorbs it readily when it has been condensed into the form of sweat. For these reasons, probably, it is that thick calico shirts, &c., have been introduced into the army for the use of soldiers. Cotton has long been a popular application to burns. Dr Anderson (Ed. M. and S. Journ. 1828) directs it to be applied in thin layers, one over the other, and retained by the moderate pressure of a bandage. Pain is allayed, local irritation and blistering diminished or prevented, and constitutional disturbance proportionally obviated. M. Reynard adopted its application in cases of Erysipelas, and M. Mayor employs it as a topical application with Calomel in cases of Ophthalmia. (B. and F. Med Rev. xx. 463.)

PYROXYLINUM, B. Pyroxylin. Gun Cotton.

Cotton fibre, as just stated, consists of *Lignine*, or Cellulose, and has the chemical composition ($C_{12}H_{10}O_{10}$). When this is acted on by a mixture of strong Nitric and Sulphuric acids, a curious change takes place. The fibre has not altered in appearance, but it is found when dried to have increased in weight about 70 per cent., and to have acquired highly explosive properties. It takes fire, explodes, and disappears, at a temperature not above 300°. This property has caused it to be used as a substitute for gunpowder; but the suddenness of its conversion into gas is one objection to its use for firearms, as likely to burst them. Gun cotton, or Pyroxylin, differs from cotton chemically in the fact that some equivalents of Nitrous acid (Peroxide of Nitrogen of some chemists) have been substituted for equivalents of Hydrogen in the Cellulose. The equivalent of Hydrogen displaced combines with one equivalent of Oxygen in the NO_5, to form water, leaving NO_4, which takes its place. Thus—

$$(C_{12}H_{10}O_{10}) + NO_5 = C_{12}H_9(NO_4)O_{10} + HO.$$

The Sulph. acid employed is of use in increasing the concentration of the Nit' acid, and preventing the solution of Pyroxyline in the latter, which would else occur. There are several kinds of Pyroxylin, differing in the number of equiv. of NO_4 substituted for equivs. of Hydrogen. (1.) If the strongest acids are used, Pyroxylin is obtained with the largest proportion of NO_4. Statements differ as to its composition, but it approximates to $C_{12}H_7(NO_4)_3O_{10}$. This Gun Cotton is highly explosive. It is soluble in Acetic Ether, but insoluble in a mixture of Ether and Alcohol. It cannot be used for photographic or medical purposes. (2.) The second kind is made by using strong Sulph. acid and Nit. acid rather weaker (as of Sp. Gr. 1·42). It is less explosive. It is soluble in Acetic Ether, and in a mixture of Ether and Alcohol. As the latter solution leaves a transparent film on evaporation, and as the sensitive Iodide of Silver is readily soluble in the liquid, the Collodion made from this kind of Pyroxylin is the favourite vehicle employed by photographers to cover the glass plate which is to be exposed to the action of light. The Collodion of photographers resembles medicinal Collodion. This Pyroxylin has the composition $C_{12}H_8(NO_4)_2O_{10}$. (3.) Another kind of Pyroxylin is made by using still weaker acids. It contains less NO_4. It is not explosive. Its ethereal solution leaves on evaporation an opaque film. It is therefore of no use in photography. It is less suitable for medical use than the last kind. The following formula for the preparation of Pyroxylin is given in the B. P.:—

Prep.—B. Take of *Cotton*, ℥j.; *Sulphuric acid*, f℥v.; *Nitric acid*, f℥v. Mix the Acids in a porcelain mortar, immerse the Cotton in the mixture, and stir it for three minutes with a glass rod, until it is thoroughly wetted by the acids. Transfer the cotton to a vessel containing water, stir it well with a glass rod, decant the liquor, pour more water upon the mass, agitate again, and repeat the effusion, agitation, and decantation, until the washing ceases to give a precipitate with Chloride of Barium. Drain the product on filtering paper, and dry in a water bath.

Tests.—"Readily soluble in a mixture of Ether and rectified Spirit; leaves no residue when exploded by heat." (B.)

This formula failed when the directions of the B. P. 1864 were closely followed. The Nit. acid ordered there had the Sp. Gr. 1·5. The Pyroxylin made with it was the first kind mentioned above. It was explosive, but would not dissolve in a mixture of Ether and Alcohol. Now that the acid of 1·42 is used (same strength as in the L. P), the soluble Pyroxylin is obtained, suitable for the formation of Collodion.

Collodium, B. Collodium. Collodion. (A Solution of Pyroxylin in Ether and Alcohol.

Prep.—B. Mix *Ether* ℥xxxvj. and *Rect. Spirit* ℥xij., and add *Pyroxylin* ℥j. Set aside for a few days, and, should there be any sediment, decant the clear solution. Keep it in a stoppered bottle.

Pyroxylin made by the directions of the B. P. 1864 would not be dissolved at all. That Pharmacopœia gave for its Pyroxylin the formula $C_{36}\,H_{22}\,(N\,O_4)_8\,O_{30}$, which would make it intermediate between the first and second kinds described above. To make Collodion the Gun Cotton must be prepared with Nit. acid of Sp. Gr. 1·42, or even lower. Collodion is a colourless, highly inflammable, somewhat viscid fluid. On exposure to the air it dries rapidly, by evaporation of the Ether and Alcohol, leaving the Pyroxylin as a thin transparent film, insoluble in water or rectified Spirit.

Action. Uses.—Employed by surgeons to protect cuts, sores, and inflamed surfaces from the air. It also contracts the skin in drying. It may be used to chaps or sore nipples, &c. *Elastic Collodion* may be made by mixing it with an ethereal solution of Caoutchouc, or a small quantity of Castor Oil, or by the new formula below. It is less irritant, and used in skin diseases, or where contraction is not desired. (The larger the proportion of Alcohol used to make the Collodion, the less does it tend to contract in drying. Pure Ether does not dissolve Pyroxylin at all.)

Collodium Flexile, B. Flexible Collodion.

Prep.—Take of *Collodion*, f℥vi.; *Canada Balsam*, gr. cxx.; *Castor Oil*, fʒj. Mix, and keep in a well-corked bottle.

Introduced in 1867. A similar preparation has for some time been in use. It has the advantage of forming a surface which does not easily crack or split with the movements of the part.

BÜTTNERIACEÆ. *R. Brown.*

THEOBROMA CACAO, Linn. Cocoa or Cacao-tree. Oleum Theobromæ, B. Cacao butter.

The Cocoa or Cacao tree is chiefly interesting in consequence of its seeds being largely employed in diet. The tree is a native of Mexico, but extensively cultivated in the West India Islands, and remarkable for its large and oval, yellow, cucumber-like capsules, hanging from the sides of the trunk and branches. These are divided into 5 cells, each filled with 8 to 10 ovoid seeds, piled one upon another, and covered by a membranous and succulent aril. There are several varieties of these seeds or *nibs*, which are more or less esteemed. The kernels of the seeds yield by pressure about one half their weight of a fatty oil commonly called *Butter of Cocoa*, at one time much lauded for its medical properties. This concrete oil, or vegetable fat, is used in the B. P. 1867, in the formation of suppositories (of Tannic acid, Mercury, Morphia, and Lead). It is to be "obtained by expression and heat from the ground seeds," and is described as being "of the consistency of tallow ; colour yellowish ; odour resembling that of chocolate ; taste bland and agreeable ; fracture clean, presenting no appearance of foreign matter. Does not become rancid from exposure to the air. Melts at a temperature of 122°."

The seeds of Cocoa pounded, digested, and boiled with water, with the oil skimmed off, and sweetened with sugar and milk, afford a wholesome and agreeable beverage. The COCOA sold in the shops consists either of the roasted kernels and husks, or of the husks only, ground to powder ; it is sometimes made from the cake left after expressing the oil from the beans. "Much of the cheap stuff sold under this name is very inferior, being made with damaged nuts that have been pressed for the oil, mixed with potato-flour, mutton-suet, &c." (*Cooley.*) *Flake Cocoa* is Cocoa ground, compressed, and flaked by machinery. *Chocolate* (from the Indian name *chocolat*) is made by triturating in a heated mortar the roasted seeds without the husks, 10 ℔s., with an equal quantity of Sugar, about 1½ oz. of Vanilla, and 1 oz. of Cinnamon (*Cadet*), into a paste, which is put up in various forms. "The mass of the common Chocolate sold in England is prepared from the cake left after the expression of the oil, and this is frequently mixed with the roasted seeds of ground peas and maize, or potato-flour, to which a sufficient quantity of inferior brown sugar or treacle and mutton-suet is added, to make it adhere together." (*Cooley.*)

Action. Uses.—Both Cocoa and Chocolate form the basis of very nourishing and agreeable beverages (whence the name of Theobroma, or food for the gods), devoid of the stimulating properties of Tea and Coffee, but apt to disagree with some people, and with many Dyspeptics, in consequence of the quantity of oily matter they contain.

CISTINEÆ, *Dec.*

The CISTINEÆ, or *Rock Rose tribe,* include Plants some of which used to be officinal in consequence of yielding LADANUM, a fragrant resin, formerly much celebrated, but now little employed. It is procured in the Levant from species of Cistus, such as *C. creticus*, *C. odoriferus*, &c., and can only be obtained pure in the situations where it is produced. It has a very agreeable smell, from the presence of a volatile oil. It was formerly employed as a stimulant, more recently as an expectorant, and continues to be esteemed by the Turks as a perfume, and used as a fumigation.

DIPTEROCARPEÆ. *Blume.*

The Dipterocarpeæ, so named from some of the divisions of the calyx being extended into long wing-like bodies, require to be noticed, as one of the species, *Dryobalanops aromatica*, Gærtn., *D. Camphora* (*Colebr.*), has been erroneously supposed by some to be the plant yielding the Camphor of European commerce. This drug is produced by one of the tribe of Laurels, the *Camphora officinarum* of Nees v. Esenbeck (*see* Laurineæ). But the kind called Sumatra or Borneo Camphor, as well as Liquid Camphor, is produced by the above tree, which is a native of Sumatra and Borneo. On the coast of the former island it is one of the largest of trees; and the same tree, it is said, which yields the oil, would have produced the Camphor, if unmolested. This kind is not seen in European commerce, because the Chinese give eighty or a hundred times more money for it than that for which they sell their own Camphor. Specimens of both the Sumatra Camphor and of the Liquid Camphor are in the Museum of King's College, having been presented by Mrs Marsden. (*See* Vreise; Motley, in Hooker's *Journal of Botany*; and *Pharm. Journal*, vol. xii. Nos. i. and vi.)

Action. Uses.—The Liquid Camphor or Oil might no doubt be beneficially employed for the same purpose as Cajaputi oil and Grass oil. The Sumatra Camphor does not appear to be preferable to that of China.

Several other important products are yielded by the Dipterocarpeæ; as Wood oil, which contains a principle analogous to Balsam of Copaiva; the Resin or Dammer of *Shorea robusta*; and Indian Copal (sometimes mixed with Amber and sold as such), which is the Liquid Varnish, inspissated, of the Piney tree, or *Vateria indica*, of which the fruits yield to boiling water the esteemed and valuable vegetable Butter of Canara.

THEACEÆ, *Mirbel.* CAMELLIEÆ, *Dec.*: a tribe of TERNSTRŒMIACEÆ.

The genus Thea forms a small group of plants with Camellia, and is remarkable for containing the plant or plants which yield the different kinds of Tea imported from China. The question was long undecided whether all the kinds of Tea were made, or could be made, from the same plant, by variations in the process; or whether it was preferable to have different varieties or kinds of plant for the distinct varieties of Tea, as, for instance, the Green and Black Teas; whether these were originally distinct species or varieties, owing to differences in soil, climate, or culture. Dr Royle was always inclined to think the latter the more probable opinion, as fully detailed in his "Illustr. of Himalayan Botany," pp. 107 to 128, and in his "Productive Resources of India," pp. 252 to 311. Two plants are known in the gardens: one of which, called *Thea viridis*, was supposed to yield only Green Tea, including—1. Imperial. 2. Gunpowder. 3. Hyson. 4. Young Hyson. 5. Twankay. This kind is capable of withstanding a greater degree of cold, and survives through the winter in the open air in this country, as may be seen in Kew Gardens. Green Teas, we know, are chiefly produced in the more northern districts of China. Some are factitiously coloured with Indigo and Sulphate of Lime, and Mr Warrington has ascertained that of the Green Teas of commerce some are *unglazed*, others *glazed*. The former are of a yellow-brown tint tending on the rubbed parts to a blackish hue, without a shade of green or blue; while the *glazed* are faced or covered superficially with a powder consisting of Prussian Blue and Sulphate of Lime or Caolin, with occasionally a yellow or orange-coloured vegetable substance (Turmeric?). Indigo with Gypsum is sometimes used, as by the China tea-makers sent to Assam. Even the *unglazed* have a little Sulphate of Lime attached to their surface, either to act as an absorbent of moisture, or to give the bloom characteristic of the green teas of commerce. The *Thea Bohea* appears distinct as a species from the former, and has been supposed to yield the different kinds of Black Tea—that is, Pekoe, Lapsang, Souchong, Congou, Bohea, &c.; the last being the inferior, and the Pekoes the best kinds of Black Tea. Plants collected in Chusan are somewhat intermediate in character. That growing wild in Assam is considered by some botanists to be another distinct species of Thea or of Camellia. Mr Ball has fully explained, in his work on the subject, the processes of manufacture by which both Black and Green Teas are produced from the leaves of the same plant. Mr Fortune (*Visit to the Tea Countries of China*) has placed beyond a doubt the fact that all the best Black and Green Teas are prepared by the Chinese from the leaves of varieties of *T. viridis*, which alone are cultivated in the north of China. *T. Bohea* is chiefly grown in the neighbourhood of Canton. The difference between Black and Green Tea mainly depends upon the fact of the Black Tea leaves having been exposed to the air, and suffered to undergo a kind of fermentation, before the process of heating.

Some Tea has been manufactured in the Government nurseries in Kumaon from plants grown from China seed, which has been pronounced of the finest quality by the best judges, and compared with the Oolong Teas of the Ankoy district. Some prepared in August 1845, in the Tea Nursery in the Deyra Doon, has also been pronounced of fine quality, and compared with Orange Pekoe. *Thea Assamica*, a large-leaved species, yields the Tea of the province of Assam.

The properties of Tea depend chiefly on the presence of Tannin, of a Volatile oil, and of a principle called *Theine* ($C_8 H_5 N_2 O_2$), which has been found to be identical with *Caffeine*, and is a salifiable base. It may be obtained in white silky needles, has a mild bitter taste, is soluble in hot water, but sparingly so in cold water and Alcohol. With S′ and H Cl it forms crystalline compounds, and is supposed to exist in Tea in combination with Tannic acid. The quantity of Tannin is stated by Brande, and it appears by the taste, and in the analysis of Mulder, to be greater in Green than in Black Tea. Sir H. Davy and others have stated that Black Tea contains the largest proportion of Tannin. The Volatile oil is in larger quantity in the Green than in the Black Tea.

Tea is well known for its astringent and moderately excitant properties, chiefly affecting the nervous system, producing some degree of exhilaration, and of refreshment after fatigue. Its effects are well seen in the wakefulness produced, especially by Green Tea, in those unaccustomed to its use. But it is thought by some to act as a sedative on the heart and blood-vessels; as Dr Billing explains it, Tea and Coffee are sedatives, and relieve the stupor produced by stimulants, or the drowsiness of fatigue, or other plethora, only by counteracting the plethoric state of the brain induced by the continued stimulation of action, thus restoring this organ to its normal state. Liebig (*Anim. Chem.* p. 179) has suggested that *Theine*, as an ingredient of diet, may be useful in contributing to the formation of Taurine, a compound peculiar to Bile. Besides being useful as a diluent, it may often be prescribed as an agreeable and refreshing beverage; in some cases, especially when made strong, acting as an excitant, and at other times producing sedative and calming effects.

AURANTIACEÆ, *Correa.*

The Aurantiaceæ are natives of tropical Asia, with a few species in Madagascar. *Limonia* (now *Skimmia*) *Laureola* is alone found in cold situations in the Himalayas; but many are cultivated in all parts of the world. A fragrant Volatile oil abounds in many parts, with a bitter principle in the rind of the fruit, and an acid or saccharine juice in the fruit. Several species of the genus Citrus are officinal.

CITRUS, *Linn.* *Polyadelphia Polyandria*, Linn.

Flowers frequently with a quinary proportion of parts. Calyx urceolate 3 to 5 cleft. Petals 5 to 8, or only 4. Stamens 20 to 60, their filaments compressed and more or less united at the base into several bundles, often 4 or 5 of them free. Anthers oblong. Style round, crowned by a hemispherical stigma. Fruit baccate, 7-12-celled. Seeds 4 to 8 in each cell, with numerous separate small bags of pulp. Seeds without albumen, seed-coat membranous, marked externally with the raphe and internally with the chalaza. Auricles of cotyledons very short. Trees or shrubs with axillary spines. Leaves compound, but often reduced to a single terminal leaflet which is joined with the petiole, and often winged. (*See* fig. 47.)

CITRUS BIGARADIA, B. *Citrus Vulgaris.* Seville or Bitter Orange.

Aurantii Cortex, B. Exterior rind of the Fruit. Orange Peel.
Aurantii Floris Aqua, B. Distilled Water of the Flowers.
Aurantii Oleum. Volatile Oil of the Flowers; Neroli Oil.

This, which is called Citrus Bigaradia by Duhamel, and also by

Risso in his work on Oranges, is supposed to have been introduced by the Arabs; because all the old-established groves of Spain, as those at Seville, planted by the Moors, are of the Bitter Orange (*Macfadyen*).

The tree is erect in habit, smaller than that of the Sweet Orange, but the flowers more fragrant. The branches are spiny. Leaves elliptical, acuminate, slightly toothed. Petioles more or less winged. Flowers large, white. Fruit uneven, more or less round, of a dark orange colour; rind with concave vesicles of oil; pulp acid and bitter. (Risso.)

Aurantii Cortex, B. Rind of the Bitter Orange.

The rind of the Seville Orange is officinal, because it is more bitter than that of the Sweet Orange, and possesses at the same time a considerable degree of aroma from the presence of volatile oil. But as the outer part alone possesses these properties, the white inner part should be removed when it is used officinally for the following preparations in its fresh state, or when intended to be dried.

Infusum Aurantii, B. Infusion of Orange Peel.

Prep.—B. Infuse for ¼ of an hour in a covered vessel *Bitter Orange Peel* cut small ℥ß, *boiling Aq. dist.* Oß. Strain.

Infusum Aurantii Compositum, B. Compound Infusion of Orange Peel.

Prep.—Take of *Bitter Orange Peel*, cut small, ℥¼; *Fresh Lemon Peel*, cut small, grs. lx.; *Cloves*, bruised, grs. xxx.; *Boiling Distilled water* f℥x. Infuse in a covered vessel for ¼ hour, and strain.

(From L. P., restored in B. P. 1867.)

Action. Uses.—Warm Tonics. Excellent vehicles for either acid, alkaline, or saline medicines, in doses of f℥jß, 2 or 3 times a-day.

Syrupus Aurantii, B. Syrup of Orange Peel.

Prep.—B. Mix *Tincture of Orange Peel* ℥j., *Syrup* ℥vij.

Action. Uses.—An agreeable stomachic, useful as an addition either to disagreeable or to tasteless draughts.

Tinctura Aurantii, B. Tincture of Orange Peel.

Prep.—B. *Bitter Orange Peel*, cut small and bruised, ℥ij.; *Proof Spirit*, Oj. 7 days. Make up to Oj.

Action. Uses.—Tonic adjunct to draughts and mixtures, in doses of fʒj–fʒiv. Contained in Mixt. Ferri Aromatica, and Tinctura Quiniæ.

Vinum Aurantii, B. Orange Wine.

Wine made in Britain by the fermentation of a saccharine solution to which the fresh peel of the bitter orange has been added (B). Introduced in 1867. It is described as "a vinous liquid, having a golden sherry colour, and a taste and aroma derived from the bitter orange peel." It contains about 12 per cent. of alcohol, and is but slightly acid to test-paper.

Pharm. Prep.—Vinum Ferri Citratis. Vinum Quiniæ.

Aurantii Floris Aqua, B. Orange Flower Water.

From the flowers of the Bitter Orange and Sweet Orange.

Procured by the same process as that by which the Essential Oil is obtained, particularly in Italy and France. Besides Essential Oil, it also contains some Acetic′. It may be prepared extemporaneously by agitating some of the Volatile Oil with distilled water, and then filtering. But it is usually imported.

Mr Squire (Br. An. of Med. i. p. 15) discovered that Orange Flower Water, which is imported from France in vessels of lead or copper soldered with lead, contains often some of the latter metal. This may be detected on the addition of a soluble Iodide, golden-coloured crystals of Iodide of Lead being deposited. He recommends the purification of the water by the immersion of a piece of Zinc wire, and then testing with Iodide of Potassium. The water should be nearly colourless, and unaffected by Sulphuretted Hydrogen, B. If either Lead or Copper is present, a blackish-coloured precipitate will be produced.

Orange-flower water is considered in France to be possessed of anodyne and antispasmodic properties, and is in constant use in doses of f℥j.–f℥ij. in nervous and hysterical cases.

Syrupus Aurantii Floris, B. Syrup of Orange Flower.

Prep.—Take of *Orange-Flower water*, f℥viij.; *Refined Sugar* ℔iij.; *Distilled water*, f℥xvj., or a sufficiency. Dissolve the Sugar in the Distilled water by means of heat; strain, and when nearly cold add the Orange-Flower water, with a sufficient quantity of Distilled water, if necessary, to make the product four pounds and a half. The specific gravity should be 1·330.

An agreeable flavouring ingredient.

Dose—ʒj.–ʒij.

Aurantii Oleum. Oil of Orange Flowers. Oil of Neroli.

A Volatile Oil being secreted in the flowers and other parts of both kinds of Oranges, is separated by distilling them with water. This is well known in France by the name of Neroli. It has a sweet aromatic odour different from that of the flower, and appears to Soubeiran to be a modification of the natural essential oil. Neroli contains a solid crystallisable oil, which has been called *Aurade* by Plisson, who discovered it. The Neroli obtained from the Bitter Orange is finer than that obtained from the Sweet Orange. But an essential Oil, known as Oil of Orange, is also obtained by distillation from the leaves of the Orange, and even by expression of the grated rind.

Action. Uses.—The Essential Oil is stimulant and antispasmodic.

CITRUS AURANTIUM, *Risso*, B. Common or Sweet Orange.

Aurantii Aqua, B. Orange-flower water.
Aurantii Oleum. Vol. oil of the flowers ; Neroli Oil.

The Orange, like the Lemon, is a native of India, being found in the forests on the borders of Silhet, and on the Neilgherries ; perhaps also in China. The Sanscrit *Nagrunga* and the Arabic *Narung* are no doubt the European names of *Naranja* (Spanish), *Arancia* (Italian), whence we have *Aurantium* and *Orange*. The Orange is not mentioned either by the ancients or the Arabian medical authors. It is supposed to have been introduced into Europe after the middle ages.

The Orange-tree attains a height of 16 or 20 feet, and bears great abundance of fruit. It is remarkable, as well as others of the genus, for bearing the fruit at all ages at the same time with the flowers. Though a native of India, it does not ripen its fruit there until the winter, and hence has been able to travel so much further north than others of its compatriots. Leaves coriaceous, ovate-oblong, acute ; margins usually finely toothed ; petioles margined, sometimes winged. Petals 5, white. Stamens about twenty, 5 of them often distinct and appressed against the stigma, the remainder in 5 bundles alternating with them. Fruit globose, rind thin, with convex oil vesicles, adhering loosely to the pulp, which is sweet.

Oranges are cultivated in the south of Europe and in the Azóres, whence they are largely imported into this country. The distilled water of the flowers is officinal. Orange-flower water and Neroli Oil are also obtained from the flowers of the Seville or Bitter Orange (q. v.)

The fruit of the Sweet Orange, and the flowers and Essential Oil of both species, were officinal in the L. P. of 1836, but were afterwards omitted.

AURANTII FRUCTUS.—The ripe fruit of the Orange is well known for its extremely agreeable and refreshing juiciness, whence it is so much esteemed as a fruit even for the sick, and as a refrigerant. When of a small size, the fruit which falls off is dried, and forms the *Aurantii baccæ*, or Curaçoa Oranges, so called from being employed in flavouring Curaçoa. The smaller ones are smoothed, and used for making issues. The rind or peel of the fruit is sometimes substituted for that of the Bitter Orange, as are also the flowers and their essential oil, the oil expressed from the grated rind, and Orange-flower water ; all being used for the same purposes as those produced from the Bitter Orange.

CITRUS LIMETTA, *Risso*, var. BERGAMIUM. Bergamotæ Oleum. Oil or Essence of Bergamot. Volatile Oil of the rind of the Fruit. Fr. *Limette et Bergamotte.*

The above is the species which yields Oil of Bergamot. It appears to belong to the same species as the *Citrus acida* of Roxburgh, as this comprehends under it varieties of the sour Limes as well as the sweet Limes found in India. Latterly Risso and Poiteau have separated the *C. Limetta* from the *C. Bergamia.*

The leaves of the latter are oblong, more or less elongated, acute or obtuse, under side somewhat pale. Petiole more or less winged and margined. Flowers usually small, white. Fruit pale yellow, pyriform or depressed: rind with concave vesicles of oil: pulp more or less acid. (Wight and Arnott, Prod. p. 96.)

Bergamot is the Volatile Oil of the rind of the fruit of the above variety, which is cultivated in the south of Europe, especially in the neighbourhood of Nice. Raybaud states that 100 fruits yield 2½ ounces of the oil by expression, which has a density of 0·88, is of a pale yellow colour, and very fragrant. It differs from the other volatile oils of this genus in containing Oxygen. It is believed to contain a mixture of oils, having the composition of Citrene with a Hydrate of such an oil, and an oxygenated oil formed by the action of the atmosphere. (*Liebig.*) From its agreeable fragrance, it has been much employed by perfumers; and was officinal in the L. P. of 1836, for the purpose of forming an agreeable addition to mixtures and unguents. It may be substituted for the Oil of Lemons, or this may be used instead of that.

CITRUS MEDICA, *Risso.* The Citron. Fr. *Cedrate.*

Citrus Medica of botanists is the Citron, distinguished by its large ovoid fruit, with extremely thick rind and proportionately small quantity of acid juice. This name has been erroneously applied to the species yielding Lemons. The rind is thick and spongy internally, tuberculated externally, and covered with numerous dots filled with essential oil (*huile de cedrat*). Its pulp is less acid and juicy than that of the Lemon. The rind of the fruit is preserved, and its essential oil separated; the juice may be employed for the same purposes as that of the Lemon.

CITRUS LIMONUM, *Risso*, B. The Lemon. Fr. *Citron* or *Limon.*

Limones. The Fruit. Lemons.

Limonis Succus, B. The freshly expressed Juice of the ripe Fruit.

Limonis Cortex, B. Lemon Peel; the rind of the fruit, outer part, fresh.

Limonis Oleum, B. Volatile Oil, expressed or distilled from the rind.

Lemons were unknown to the ancients, and also to the Arabs, though noted in Persian works on Materia Medica by the names *Leemoo* and *Neemboo*, and stated to be natives of India, where they are indigenous, and known by nearly the same names. The author has found the tree apparently wild in the forests at the foot of the Himalayan mountains. The annexed figure (47) is from one of these plants. Limes are produced by a distinct species, *Citrus acida*, and not by *C. Limonum*, as stated by the E. P.

They form shrubs of from 10 to 15 feet in height, much branched, with stiff awl-shaped thorns. Leaves oval, oblong-oval: margin serrulate, or slightly toothed: petioles with a narrow leafy border, or simply margined. Flowers with 5, sometimes 4 petals. Stamens 20 to 30, in 4 or 5 bundles. Fruit of a light-yellow colour when quite ripe, ovoid in shape, with a more or less nipple-like knob at the apex. Rind thin with numerous vesicles of oil, adhering closely to the pulp, which is very acid.

Though Lemons are originally natives of India, they are now imported into this country from the south of Europe and the Azores, each being separately rolled up in paper. The best plan "consists in packing them with newly-slaked lime in bottles or earthenware jars, the mouths of which are secured with cork and wax." (*c.*)

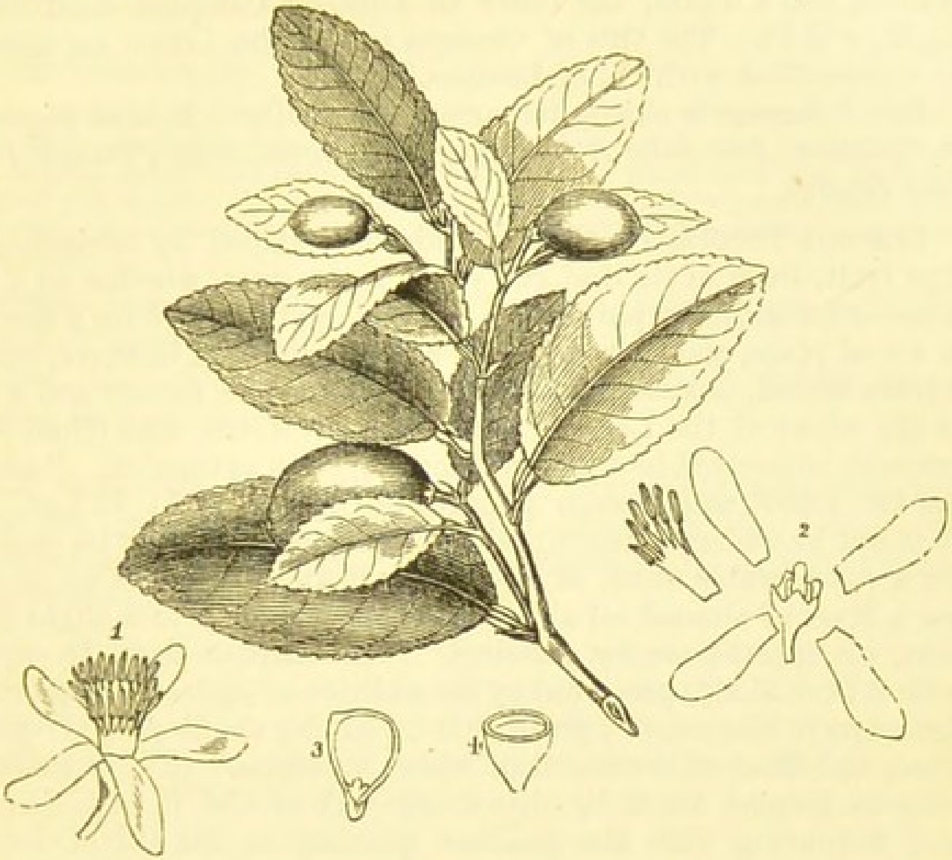

Fig. 47.

LIMONIS CORTEX, B. Lemon Peel is of a light-yellow colour, but becomes of a brownish hue when dried. It is bitter and aromatic, from containing some Bitter Extractive which is insoluble in Ether, but soluble in Alcohol; and abundance of fragrant Volatile Oil, stored up in the numerous vesicles with which the rind is studded. It forms an agreeable addition to different tinctures and infusions, and is used to make a *Syrup* and *Tincture of Lemon.*

LIMONIS OLEUM, B. Oil of Lemon.—This, like the Oil of Orange, may be obtained either by distillation, or by simple expression of the finely grated rind. The latter is of the finest quality, of a light colour, and fine lemon odour, warm, penetrating, and bitter taste. Sp. Gr. 0·848 to 0·85 and higher, boils at from 330° to 353°, being a mixture of two oils, which may be separated by distillation to a certain extent. One of them, Citrene, has the Sp. Gr. 0·847, and boils at 330°; the other, Citrelene, has the Sp. Gr. 0·88, and boils at 345° to 353°. (Liebig, in Turner's *Chem.*) Both these and the Oil of Lemons have the composition of the Oil of Turpentine, and are probably composed of $C_{10}H_8$. They are, therefore, when pure, true

Hydrocarbons. Oil of Lemon absorbs Oxygen when exposed to the atmosphere. Acted on by Hydrochloric acid, it forms two compounds, one a liquid, the other an artificial Camphor composed of $C_{10}H_8 + HCl$. The Oils of Oranges and of the Citron are identical in composition with Oil of Lemons.

Oil of Lemon is chiefly imported from Sicily. It is an ingredient in *Spiritus Ammoniæ Aromaticus* and *Linimentum Potassii Iodidi cum Sapone.*

LIMONIS SUCCUS, B. Lemon Juice is obtained by subjecting the ripe fruit, freed of its rind and seeds, to pressure, whether on a large scale or for ordinary purposes. It is allowed to stand for a few days in a cool place, and then decanted and filtered. It, however, remains a little turbid, is sharply acid, with an agreeable flavour and a little of the odour of the Lemon. It consists of Citric acid (from 5 to 6 per cent.) dissolved in water with mucilage and extractive. "Average Sp. Gr. 1·039, and average quantity of Cit' acid in ℥j. 32·5 gr." (B.) It is apt to undergo decomposition, but with care may be preserved for a considerable time, as by corking it up in full bottles, or pouring a layer of almond oil above it; some subject it to a slight ebullition, or concentrate by freezing. "The British navy is supplied with it from Sicily, preserved by the addition of $\frac{1}{10}$th of strong brandy; druggists in this country preserve it by adding about $\frac{1}{10}$th of spirit of wine, and filter off the mucilage which separates." (*c.*) A substitute may be formed for it by dissolving ℥jß of *Cit'* in *Aq. dest.* Oj., and flavouring with the smallest quantity of the Oil of Lemons. (*Phillips.*)

Action. Uses.—Refrigerant, Antalkaline, Antiscorbutic. Diluted with water, it forms a refreshing drink in hot climates, or in febrile and inflammatory complaints, made more agreeable with sugar, in the well-known form of Lemonade, or added to barley, rice-water, &c. It has been recommended in Rheumatism. It is much employed in making effervescing draughts; in imitation of which *Effervescing Lemonade* is prepared by the soda-water manufacturers. The Citrates and Tartrates are converted into Carbonates in passing through the system, and will produce an alkaline reaction on the urine. Antiscorbutic: hence about ℥j. or ℥ij. are distributed to seamen in long voyages as a prophylactic, or f℥iv.–f℥vj. for the cure of Scurvy. Citric acid is sometimes substituted for it.

Artificial Lemon Juice may be made by dissolving Citric or Tar' ℥ijß, Gum ℥ß, fresh Lemon Juice ʒvj., fine Sugar ℥ij., Aq. ferv. Oij. Allow it to cool, and strain.

Lemonade.—Macerate 2 *Lemons* sliced, and *Sugar* ℥ij., in *Aq. ferv.* Oj. till cool, and strain.

Aërated or Effervescing Lemonade.—Mix *Water* Oj., charged with five times its volume of *Carb' gas*, with *Syrup of Lemons* f℥ij.

TINCTURA LIMONIS, B. Tincture of Lemon Peel.

Prep.—B. *Fresh Lemon Peel* sliced thin, ℥ijß, *Proof Spirit*, Oj. Seven days. Make up with Proof Spirit to Oj.

An agreeable preparation, which, containing both the oil and bitter of the Lemon peel, is aromatic and tonic.

Dose.—fʒj.–fʒiij.

SYRUPUS LIMONIS, B. Syrup of Lemons.

Prep.—B. Take of *Fresh Lemon Peel*, ℥ij.; *Lemon Juice*, strained, Oj.; *Refined Sugar*, ℔ij¼. Heat the Lemon juice to the boiling point, and, having put it into a covered vessel with the Lemon Peel, let them stand until they are cold, then filter and dissolve the sugar in the filtered liquid with a gentle heat. The product should weigh three pounds and a half, and should have the specific gravity 1·34.

It differs somewhat from the L. Syrup in being made with the peel as well as the juice of the Lemon.

Action. Uses.—An agreeable addition to diluent drinks or to draughts, in doses of fʒj. to fʒiv.

ACIDUM CITRICUM, B. Citric Acid. A crystalline acid prepared from the Juice of the fruit of *Citrus Limonum* (the *Lemon*), or *Citrus Limetta* (the Lime). Acid of Lemons. *F.* Acide Citrique. *G.* Citronensaüre.

Citric acid is that which gives the sour taste to the juice of the Lemon and Lime, and has been so named from Citrus. It is also contained in the juice of some other fruits, as in acid Grapes, in Tamarinds, in the Gooseberry, Red Currant, Cranberry, Bird-Cherry, usually mixed with some Malic acid, sometimes combined with Potash or with Lime. In the juice of Lemons and Limes it is in a free state, mixed only with mucilage and similar vegetable impurities, which prevent its crystallising. It was first separated from these and obtained in a solid form by Scheele in 1781. To separate the Citric acid from the admixtures, Lime may be presented to it. With this it combines, and is precipitated in the form of Citrate of Lime. This is separated and decomposed by dilute Sulphuric acid, when an insoluble Sulphate of Lime is formed, and the Citric acid becomes dissolved. Lemon Juice is sometimes imported instead of the Lemons, and the acid has been imported in the form of Citrate of Lime. (See below.)

Prep.—B. Take of *Lemon Juice*, Oiv.; *Prepared Chalk*, ℥ivß; *Sulphuric acid*, f℥ijß; *Distilled water*, a sufficiency. Heat the Lemon juice to its boiling point, and add the Chalk by degrees till there is no more effervescence. Collect the deposit on a calico filter, and wash it with hot water till the filtered liquid passes from it colourless. Mix the deposit with a pint of distilled water, and gradually add the Sulphuric acid previously diluted with a pint and a half of Distilled water. Boil gently for half-an-hour, keeping the mixture constantly stirred. Separate the acid solution by filtration, wash the insoluble matter with a little Distilled water, and add the washings to the solution. Concentrate this solution to the density of 1·21, then allow it to cool, and after twenty-four hours decant the liquor from the crystals of Sulphate of Lime which will have formed; further concentrate the liquor until a film forms on its surface, and set it aside to cool and crystallise. Purify the crystals if necessary by re-crystallisation.

[If the lime were added at once to fresh lemon juice, the mucilage of the juice would adhere obstinately to the precipitated Citrate, and interfere with the subsequent crystallisation. This mucilage is partly got rid of by first boiling the liquid, still better by fermenting it, as in B. 1864. In the latter case the sugar in the juice forms Alcohol, in which the mucilage is insoluble.]

Chalk being added to the cleared liquid, the Cit. acid combines with the lime with effervescence, forming an insoluble Citrate of Lime. $S\,O_3$ being added, it combines with the lime, setting the Cit. acid free. The Sulphate of Lime remains only partly undissolved, the rest is left in solution. The concentration to 1·21 causes the greater part of this to separate in crystals.

When Citric acid is prepared on the large scale, the Carbonic acid which escapes on the addition of the chalk is collected, and applied in the manufacture of Bicarbonate of Soda; also, the Sulphate of Lime which subsequently remains is applied to various economical purposes, among others, to the preparation of Tart. acid, q. v. (P. J. x. 402.)

To get rid of the vegetable mucilage, Dr Price has proposed to add a free Alkali, such as Ammonia or Potash, until the juice is neutralised, thus forming a solution of a soluble Citrate, which may be separated in crystals on evaporation. The alkaline Citrate is then again dissolved, and precipitated by adding a salt of Lime, &c. (P. J. xiii. 313.)

The impure Citrate of Lime soon decomposes when kept, the Citric acid forming Acetic, Butyric, and Carbonic acids, with free Hydrogen. (Personne.)

In the Bahamas, and in other West India Islands, immense quantities of Limes and Lemons are annually wasted, and allowed to rot. It has been thought that their juice might be expressed and neutralised with Lime, and the Citrate of Lime thus obtained form a profitable article of export to England, where Cit. acid might be manufactured from it. But the fact just stated would form an obvious objection to such a plan.

Citric acid ($C_{12}\,H_5\,O_{11} + 3\,HO = Cit'$) is colourless and transparent, without odour, of a strong but agreeable acid taste, crystallises in transparent short rhomboidal prisms terminated by four planes, apt to become moist in damp air, soluble in three-fourths of cold and half its weight of hot water. The solution spoils when it has been some time kept, becoming ropy from spontaneous decomposition. Cit′ is also soluble in Alcohol. When heated with Sul′, it is resolved into Carbonic oxide, Carb′, Ac′, and water. Nit′ converts it into Oxalic′, and when melted with caustic Potash, Ox′, Ac′, and water are produced. By heat it is fused in its own water of crystallisation, and at a higher temperature decomposed. When obtained at ordinary temperatures, it crystallises with 5 Eq. of water, two of which are water of crystallisation; but when deposited from a solution cooled from 212°, the crystals contain only 4 Eq. Aq. three of which are basic, and 1 Eq. water of crystallisation (as stated by the B. P.) The effects of heat on Citric′ have been studied by several chemists. The decompositions recounted by Liebig (Turn. *Chem.* 1005) have been cleared up by Crasso. Crystallised Citric′ when exposed to heat, exhibits four stages of decomposition. During the first, the water of crystallisation alone is given off, and the residue contains unaltered Cit′. The second stage is characterised by white vapours, and the production of Acetone, Carb. oxide, and Carb′, while the residue consists of Hydrated Aconitic acid, which is therefore the true Pyrocitric′. In the third stage, the Aconitic′, not being volatile, is itself decomposed, yielding Carb′ and an oily liquid (Citricic′, *Baup*), which Crasso proposes to call Itaconic acid. In the fourth period, empyreumatic oil is produced, and a voluminous coal remains behind. Citric acid forms numerous salts: those of the alkalies are soluble, and often prescribed in the form of effervescing draughts.

The Citrates of Iron, also soluble, have already been mentioned at p. 172. The Citrates of Baryta, Strontian, Lime, Lead, and Silver are insoluble. If the acid be added in excess to Lime water, no precipitate is observed until it is heated. Gr. lx. Cit′ will saturate gr. cxx. of crystal. Carb. Soda.

Tests.—Citric acid is apt to be adulterated with Tartaric acid; but the latter is easily detected by any of the soluble salts of Potash.

It is colourless, and entirely destroyed by heat. It is soluble in water and in spirit. What is precipitated from its solution by Acet. Lead is soluble in Nit. acid. No salt of Potash but the Tartrate causes any precipitate. (This precipitates the Bitartrate.) Added sparingly to cold Lime water, it does not cloud it. *70 grs. dissolved in water are neutralised by* 1000 *measures volumetric sol. Soda* (*B.*)

Inc.—Alkalies and earths, Carbonates, most Acetates, Tartrate of Potash.

Action. Uses.—Refrigerant, Antiscorbutic, Antialkaline. Substitute for Lemon Juice; employed for making effervescing draughts.

Gr. xx. of the following Salts will saturate	Lemon Juice, or Sol. Cit′.	Citric acid.	Or Citric acid gr. xx. saturate.
Bicarb. of Potash . . .	fʒiijß.	gr. 14	29 grs.
Carbonate of Potash . .	fʒiv.	gr. 17	24 grs.
Sesqui-Carb. of Ammonia .	fʒvj.	gr. 24	17 grs.
Carbonate of Soda . .	fʒiiß.	gr. 10	41 grs.
Bicarbonate of Soda . .	fʒiv.	gr. 17	24 grs.

BELÆ FRUCTUS, B. Bael. Ægle Marmelos, *Correa.* The half-ripe fruit, dried. *Bengal Quince.*

This medicine was introduced from India a few years since. It seems scarcely of sufficient importance to warrant its introduction into the B. P. The bark of the root, and the dried half-ripe fruit, have been used as astringents, especially in dysentery, under the above name. They resemble somewhat the analogous parts of the Pomegranate (q. v.) They should be administered in the same way, and are not unlike them in medicinal properties.

Botan. Char. (generic).—Calyx 4–5 toothed. Petals 4–5, patent. Stem 30–40. Filaments distinct, anthers linear-oblong. Ovary 8–15 celled. Ovules numerous. Style short, stigma capitate. Fruit baccate, with hard rind. Seed-coat woolly, covered with slimy liquid. Trees with simple spines. Leaves pinnate, leaflets 3 or 5. Peduncles axillary, few flowered. Flowers large.

ÆGLE MARMELOS.—A tolerably large erect tree, bark ash-coloured, branches few and irregular, thorns axillary, sharp and strong, leaves ternate, panicles small, terminal, or axillary. Flowers large and white: berry large, spheroidal, smooth, hard-shelled, 10–15 celled; cells contain besides the seeds a large quantity of tenacious transparent mucus, which on drying becomes very hard, and remains transparent; seeds 6–10 in each cell, oblong, a little compressed, woolly.

The plant is a native of Malabar and Coromandel; it belongs to the nat. ord. Aurantiaceæ. The fruit is roundish, many-celled, with a hard rind. When gathered it is about the size of a large orange. It is imported in dried slices, or in fragments of rind, with dried pulp and seeds adherent. The rind is about 1½ line thick, with a smooth pale-brown or greyish epidermis; internally, as well as the dried pulp, it is orange or cherry red. The moistened pulp is mucilaginous and astringent in taste, but there is more astringency in the rind, which contains a considerable proportion of (modified) tannic acid. The ripe fruit it nutritious, fragrant, and slightly cathartic. It is used, like the tamarind, to form cooling drinks.

Action. Uses.—Bael has been strongly recommended as an astringent in Chronic Dysentery. Also in Diarrhœa when there is much irritation. It is said to have the advantage over many astringents of not leaving constipation as an after-effect.

The liquid extract presents it in a good form for use in these complaints.

Extractum Belæ Liquidum, B. Liquid Extract of Bael.

Prep.—Take of *Bael*, ℔j.; *Distilled water*, Oxij.; *Rectified Spirit*, f℥ij. Macerate the Bael for twelve hours in one-third of the Water; pour off the clear liquor; repeat the maceration a second and third time for one hour in the remaining two-thirds of the Water; press the marc; and filter the mixed liquors through flannel. Evaporate to fourteen fluid ounces; and, when cold, add the Rectified Spirit.

On account of the great hardness and toughness of the rind, cold water will leave undissolved some of the active parts. A decoction which contains the demulcent mucilage and starch, is used by the physicians of Malabar. Each fluid ounce of this extract represents an ounce of Bael.

Dose.—ʒj.–℥ß.

Guttiferæ, *Jussieu.* (Clusiaceæ, *Lindl.*)

The Guttiferæ are found in the tropical parts of Asia and America. Many of the species yield a yellow resinous juice like Gamboge, useful both as a pigment and as a medicine. The fruit of some is edible, the seed oily, and the wood hard and useful as timber.

Cambogia, B. Gamboge. A Gum-resin obtained from Garcinia Morella, *Desrouss.*, var. pedicellata. Imported from Siam.

Gamboge is stated by Murray (App. 4, p. 110) to have been first introduced to the notice of Europeans by Clusius, who received it from China in 1603. It is known in India by the name of *ossareh rewund*, or juice of Rhubarb. This substance is mentioned in Persian works on Materia Medica; but we are unable to ascertain when Gamboge came to be substituted for the real Extract of Rhubarb, which Dr Falconer informs us he obtained in Tibet by the same name. Two kinds of Gamboge, the Siam and the Ceylon, are known in commerce. The former is commonly in cylinders, either solid or hollow. Specimens of both kinds were given to Dr Royle by G. Swinton, Esq., when Chief Secretary of the Indian Government, which had been sent to him officially from Bankok, as the produce of Siam. This form is no doubt given by the Gamboge when in a fluid state being run into hollow bamboos, as described by Lieut. White. Dr Royle was indebted to Dr Pereira for one of these imported a few years since. Kœnig learned from a Catholic priest, who officiated as such to the Christians of Cochin-China, that Gamboge was obtained from the plant by breaking off the leaves and young shoots, and receiving the yellow juice as it issued in drops in suitable vessels, a cocoa-nut or a bamboo; also, that it formed a part of the tribute paid to the king of Siam. It is therefore most probably abundant, perhaps cultivated.

There has long been reason to suppose that Siam Gamboge was yielded by some one or more species of Garcinia. About the name or names of the species there has been much uncertainty. It was long since referred by Hermann to two plants, one of which is now called *Garcinia Cambogia*, the other *G. Morella*. The *G. pictoria* of India appears to produce some Gamboge there. Dr Royle once conjectured that Siam Gamboge might be yielded by *G. Cochin-chinensis*, which has been found extensively in Cochin-China, and is described by Rumph (iii. p. 58) as exuding, when wounded, a yellow viscid juice, which quickly dries up. A guttiferous plant, which produces a similar yellow juice, possessing purgative properties, was forwarded to Dr Royle from Rangoon by Dr Malcolmson.

But Dr Christison received from Singapore in 1849 specimens of a tree which was cultivated in that colony by Dr Almeida, and had been obtained by him direct from the Gamboge district of Siam. This is doubtless the true Gamboge tree. It is a diœcious plant, and belongs apparently to Garcinia (the Gamboge-bearing section of Wight), strongly resembling in its foliage *Garcinia elliptica*, Wallich, and *G. Morella*, Desrousseaux, but differing from those plants in the male flowers and fruit being peduncled. Specimens of the same plant were obtained from Singapore in 1864 by Mr D. Hanbury, and forwarded by him to Mr Thwaites of the Government Botanic Garden in Ceylon. Mr Thwaites identified them with *Garcinia Morella*, Desrous., var. *pedicellata*. (*G. Morella* is the same as *Hebradendron Cambogioides*, Graham, one of the Cingalese plants mentioned by Hermann in the 17th century.)

Siam Gamboge is the kind in general use. It was referred by the L. P. and B. P. (1864) to *Garciniæ species incerta*, but may now fairly be regarded as the produce of the above-named variety of *Garcinia Morella*. The name *Stalagmitis Cambogioides*, quoted in the L. P. of 1836, was applied to a single specimen, supposed to be the true Gamboge plant, and which is still in the British Museum. This Mr Brown ascertained to be formed of two plants joined together by sealing-wax, one being *Xanthochymus ovalifolius*, Roxb., and the other *Hebradendron Cambogioides* of Graham (*G. Morella*).

The Ceylon Gamboge is found in the bazaars of India, but is seldom met with in Europe. Mr Charles Groves, now of Liverpool, informed Dr Royle in 1832, that when engaged in the trade of Ceylon, he had sent a considerable quantity of the Gamboge of that island to London; but it was found to be unsaleable from its inferior quality. Two trees yielding a Gamboge-like substance in Ceylon were first made known by Hermann in 1670: one Goraka, *Garcinia Cambogia;* and the other, *Kana* (or eatable) *Goraka*, *Garcinia Morella* of later authors, *Stalagmitis* of *Moon's Cat.*, *Hebradendron Cambogioides*, Graham. The latter (though it is best referred to Garcinia with an amended character) was named and described by Professor Graham of Edinburgh, from specimens and drawings sent him by Mrs Colonel Walker, who had seen the tree in different parts of the island of Ceylon. Colonel Walker writes to Dr Wight, that it is found in great abundance along the western and eastern coast in the neighbourhood of Battacola, as well as inland, especially in low sandy ground, about Kanderaane, Negombo, and towards Chilau; also 100 miles inland, at so high an elevation as 2000 feet above the sea. Mrs Walker says, the Gamboge is collected by incisions into the bark, or by cutting pieces off about the size of the palm of the hand, early in the morning. The Gamboge oozes out in a semi-liquid state, but hardens on exposure to the air, and is scraped off by collectors next morning. She describes it as brilliant and excellent, and as good for water-colour drawing as any she ever used. Dr Christison has shown that it has all but an identity of composition with that of Siam; and its medicinal effects were considered precisely the same by Dr Pitcairn in Ceylon, and Drs Graham and Christison in Edinburgh. That procured in Indian bazaars, which is spongy in structure, was not found to be so good as a pigment by the E. I. Company's painters, when under Dr Royle's charge; nor did he find it so effective as a purge, in the hospitals at Saharunpore. Dr Graham ascribes its inferiority, probably with truth, to the want of care in preparing the article for market.

Garcinia Morella (fig. 48) forms a moderate-sized tree, with the leaves obovate, elliptical, abruptly subacuminate, the male flowers clustered in the axils of the petioles, on short single-flowered peduncles. Sepals yellow on the inside, yellowish-white externally. Petals yellowish-white, red on the inside near the base. Berry about the size of a cherry (5), round, firm, with a reddish-brown external coat, and sweet pulp. Ripe in July. *Hebradendron Cambogioides* of Graham.

The sub-genus HEBRADENDRON of Graham has diœcious flowers. ♂ Calyx membranaceous (1) sepals 4 persistent. Petals 4. Stamens (2) monadelphous, column 4-sided, anthers terminal, (3) opening by the circumcision (4) of a flat and umbilicate terminal lid. The inflorescence of the female tree is similar to that of the male. Its flowers white and a little larger, with a germen in miniature of the fruit, and surrounded like it with several (ten?) abortive stamens; crowned by a lobed and muricated sessile stigma. The berry (5) is many or 4-celled, cells one-seeded. Cotyledons fleshy, united. Radicle central, filiform. Trees with entire leaves.

Besides the above species, there is probably another belonging to the same sub-genus, or to the same group of a larger genus, *i.e.*, *Garcinia*, which yields a very good kind of Gamboge, and one which may prove a good substitute for either the Ceylon or Siam kind,—and that is *Garcinia pictoria*, Roxb. Fl. Ind. ii. p. 627. Dr Roxburgh says, "I have frequently received samples of the Gamboge the produce of this tree, from my good correspondent, Mr S. Dyer, the Surgeon at Tellicherry, and I have uniformly found it, even in its crude unrefined state, superior in colour, while recent, to every other kind I have yet tried; but not so permanent as that from China." This, Mr Dyer, when in London, stated that he could not understand; for he found it excellent as a pigment, and effective as a purgative, and, as far as he remembered, equal to the Gamboge then in common use. Dr Christison had obtained some of the "Coorg or Wynaad Gamboge," which he supposes to be the produce of this tree, and confirms Mr Dyer's statement as to its valuable properties. As Mr Dyer favoured Dr Royle with a full-sized coloured drawing of the foliage and fruit of this species, a wood-cut is annexed, for it evidently belongs to the same genus as the above, to which indeed it has been referred with a query by Dr Graham, and by Dr Lindley in his Floria Medica, p. 114, where he has reprinted Dr Roxburgh's description. Good specimens of this Gamboge were sent to the Great Exhibition in 1851; as also some excellent samples from Mysore to the Paris Exhibition in 1855.

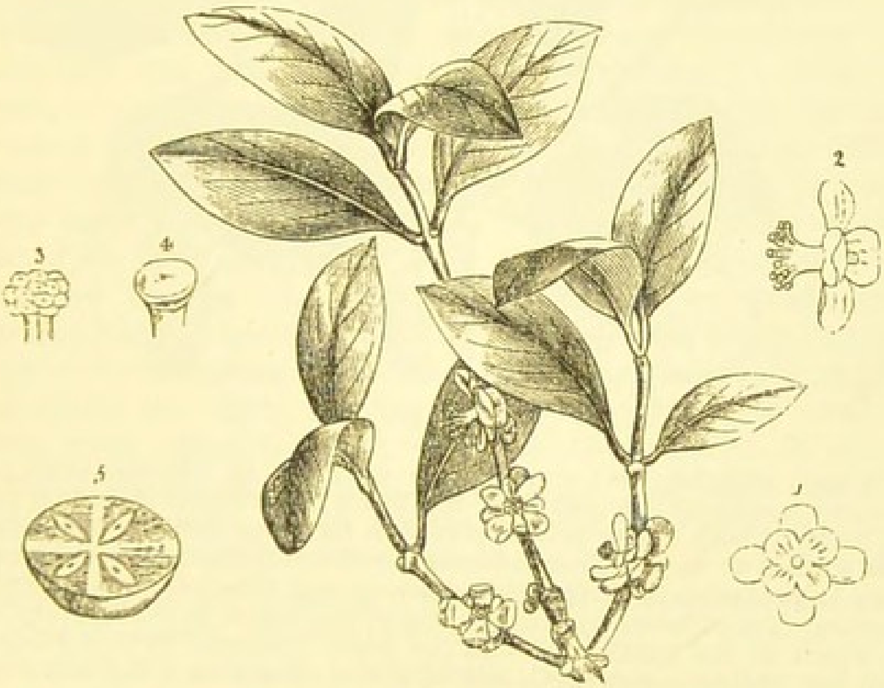

Fig. 48.

G. (*v. H.*) *pictoria* (fig. 49) is a tall tree with a pretty thick bark, having considerable masses of Gamboge on its inside. Leaves with short petioles, oblong ventricose, rather acute, from 3 to 4 inches long by 1½ or 2 broad. Flowers yellow, axillary, solitary. Calyx (2) permanent of 2 pairs of concave obtuse sepals. Petals four. Stamens from 10 to 15, with their filaments united into four bodies, which are again united at the base into a narrow ring. "Anthers of the male flower 'peltate,' of the female 2-lobed and seemingly fertile." Germ superior, round, 4-celled, (3) one ovule in each attached to the axis a little above its middle. Stigma 4-lobed, permanent. Berry (1, 2, 3) size of a large cherry, oval, smooth, very slightly marked with four lobes, crowned with the sessile, 4-lobed verrucose, permanent stigma. Rind leathery, of a reddish colour. Seeds 4, when all ripen (4, 5, 6) oblong reniform. The filaments in the male flowers are described as being numerous, and the anthers peltate. A native of the Malabar and Wynaad jungles, and the Mysore ghauts; also found near Mergui in Tavoy. *G. elliptica*, a native of Silhet, has also been found in Tavoy, and yields a kind of Gamboge.

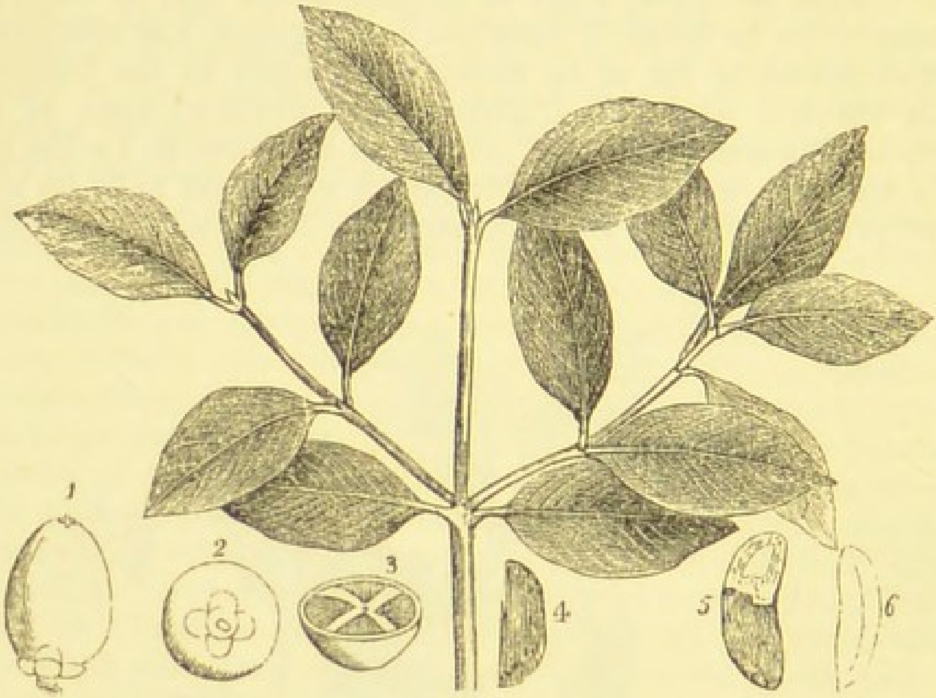

Fig. 49.

Dr Wight, who has paid considerable attention to the characters of the genera and species of the Guttiferæ, has in his Illustrations of Indian Botany, p. 126, referred both of the above species to Garcinia, section Cambogia. Of the last species he says, "Though I consider this a distinct species, I am unable from an examination of Roxburgh's drawing and description to assign better characters. The difference of the anthers of the female flower affords the best mark, which in the former are, like the male, "peltate," in this 2-lobed and 2-celled (the ordinary structure), and of course thus reduce the value of that character as a generic distinction.

Dr Christison has ascertained that the Gamboge of Siam is as nearly as possible identical in composition and properties with that of Ceylon. He indeed infers that the plant may possibly have been introduced from Siam with the religion of the Buddhists. It is well known, however, that the Buddhist religion travelled in an opposite direction, that is, from India and Ceylon to Siam, &c.

Prop.—(1). *Siam Gamboge* is usually seen in cylinders (whence it is commonly called *pipe Gamboge*), either solid or hollow in the centre, varying in length, and in thickness from ½ to 2 inches, striated externally, evidently from the impressions of the bamboo mould into which it was run when soft. Sometimes these cylinders are doubled upon themselves, at others stuck together, all generally of fine quality. (2.) *Lump* or *Cake Gamboge* occurs in round cakes or masses, several pounds in weight, most commonly inferior in quality to the former, and often mixed with impurities, as fecula and woody fibre. (3.) *Coarse Gamboge* is formed of the fragments and inferior pieces of the other, which are, however, often mixed with impurities, and not entirely soluble in ether and water. These three kinds come from Siam.

Ceylon Gamboge, though unknown in European commerce, is sometimes seen in irregular masses, often cavernous, or with many sinuous hollows, like the sponge, probably from having oozed out irregularly; the colour a uniform yellow, except on the parts exposed to light, where it is darker; brittle in texture. There seems to be no difficulty in obtaining it in a pure state, and if so, it might become an article of commerce from Ceylon. The pure pieces were found by Dr C. to be identical in composition and purgative properties with the Gamboge of Siam. The specimen in King's College Museum was given to Dr Royle by the late Dr Malcolmson.

Gamboge is without odour, and has very little taste; but after a short time a little acridity and uneasiness are experienced in the fauces; and the fine dust, raised in pulverising it, irritates the nostrils, so as to produce a flow of mucus. It is very brittle. In cylindrical pieces, breaking with a smooth, conchoidal, glistening fracture; colour tawny, changes to yellow when it is rubbed with water; taste acrid. An emulsion, made with boiling water and cooled, does not become green with solution of Iodine, showing the absence of Starch. A portion is dissolved by water, and the remainder forms a perfect emulsion, which is not easily deprived of its colour by filtration. Rectified Spirit dissolves a large portion, Ether about four-fifths, leaving only Gum, which has been called *Arabin*, from being the kind of which Gum Arabic is composed, and which has the composition $C_{12} H_{11} O_{11}$. The Resin dissolved by the Ether has been called Gambodic acid by Professor Johnston. Its qualities are said by Buchner to be those of a fatty acid. It may be obtained pure, and of a fine reddish-yellow colour, by distilling off the Ether. It will impart its colour to 10,000 times its weight of Spirit or water. Like other Resins, it is dissolved by solution of Potash (forming Gambodiate or Gambogiate of Potash, of a deep-red colour), as well as by the other caustic alkalies, from which it may again be separated by the addition of an acid. Comp. $C_{40} H_{23} O_8$ (*Johnston*). It also contains a little of a peculiar red-yellow colouring matter soluble in water and Alcohol.

Exposed to heat, it burns with a white flame, emitting much smoke, and leaving a spongy charcoal. In 100 parts of it, Braconnot found 19·5 parts of Gum, 0·5 of impurities, and 80 of a red, insipid, transparent, resinous substance, becoming yellow by pulverisation.

The following analysis is by Dr Christison:—

Pipe Gamboge of Siam.		Cake Gamboge of Siam.		Ceylon Gamboge.	
Resin	72·2	Resin	64·8	Resin	75·5
Arabin	23·0	Arabin	20·2	Arabin	18·3
Moisture	4·8	Fecula	5·6	Cerasin	0·7
		Lignin	5·3	Moisture	4·8
		Moisture	4·1		

Tests.—The characteristics of good Gamboge have been given above. Iodine will detect Starch, turning the emulsion to a green colour. Mechanical impurities can be seen. In external appearance it can only be confounded with the yellow resinous juices of some others of the Guttiferæ: of these that of *Garcinia Cambogia* as described by Dr Christison, is soft, of a pale lemon-yellow colour, and incapable of forming an emulsive paste with the wet finger. That of *Xanthochymus pictorius* has a pale yellowish-green colour and some translucency, and is not at all emulsive. Also, as observed by Dr Pereira, it may be confounded with *yellow gum* or rather resin of the Grass-tree, *Xanthorrhœa hastilis* of New Holland. The presence of Gamboge may be detected by the effects produced by it on Water, Alcohol, Ether, and Caustic Potash. The *Gambogiate of Potash* gives, if the alkali be not in excess, with acids a yellow precipitate (*Gambogic acid*), with Acetate of Lead a yellow precipitate (*Gambogiate of Lead*), with Sulphate of Copper, a brown (*Gambogiate of Copper*), and with the Salts of Iron, a dark-brown precipitate (*Gambogiate of Iron*). (*p.*)

Action. Uses.—Drastic Hydragogue, Purgative, Anthelmintic. Useful in obstinate costiveness, Amenorrhœa, Dropsy. Better given in combination than by itself, as in the following pill, originally introduced by Dr G. Fordyce, and to which Morison's Pills are similar, though with the objectionable addition of Cream of Tartar.* An alkaline solution has been employed on the Continent as a powerful diuretic.

Dose.—Gr. ij.–gr. v., in combination with Calomel, Scammony, &c.

Pilula Cambogiæ Composita, B. Compound Gamboge Pill.

Prep.—B. Take of *Gamboge*, ℥j.; *Barbadoes Aloes*, ℥j.; *Compound Cinnamon Powder*, ℥j.; *Hard Soap*, in powder, ℥ij.; *Syrup*, a sufficiency. Mix the Powders, add the Syrup; and beat the whole into a uniform mass.

Dose.—Gr. v.–gr. xx.

Canellaceæ, *Martius*.

Canella alba, *Murray*. Cortex, B. The Bark. White Canella. *Dodecandria Monogynia*, Linn.

The name Canella, a diminutive of Canna, was at one time applied to the Cinnamon, whence its French name Canelle. When the present Canella was discovered in South America, it was supposed to be the true Cinnamon, and called by its then name. The earliest full, though not the first, account was given by Monardes (Clus. Exot. p. 323), who states that in 1540 an expedition was sent by Pizarro to examine the province Cumaco, where this Cinnamon was said to be found. It was long confounded with Winter's Bark, and at one time called *Winterania Canella* and *Spurious Winter's Bark*, though

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In the trial of Morison and others *v.* Harmer and Bell, the late Professor Daniell, in analysing twelve of Morison's pills, No. 2, found of Resin of Aloes $5\frac{6}{10}$ grs., Resin of Gamboge $4\frac{1}{10}$ grs., pounded Colocynth 2 grs., Gum $4\frac{7}{10}$ grs., and Cream of Tartar $6\frac{7}{10}$ grs.

both had been clearly distinguished by Sir Hans Sloane in Phil. Trans. 1692. (*See* fig. 50.)

Canella alba is a tree which is common in many parts of the West India Islands and in South America, frequently on the sea-coasts, where it seldom exceeds twelve or fifteen feet, but in the inland forests it attains a more considerable height. It is propagated chiefly by wild pigeons feeding on its berries. The tree has a straight stem and branched top, and a good deal resembles the Pimento.

Fig. 50.

The bark is whitish, so that the tree is at once distinguished from others in the woods. The leaves are petiolate, alternate, but not regularly so, obovate, the younger ones pellucido-punctate; the older smooth, shining, of a thick consistence, without nerves, very entire and exstipulate. The flowers are arranged in terminal corymbs, small and of a violet colour, but seldom open. Sepals 3, imbricate, roundish. Petals 5, hypogynous, oblong, twisted in æstivation. Stamens united into a subcylindrical tube (1). Anthers 21, linear, fixed longitudinally on the outside of the tube. Ovary free, but included within the stamen-tube, 3-celled. Style cylindrical. Stigma 2-lobed (2.) Berry by abortion 1 or 2 celled; cells 2–3 seeded; seeds one above the other (3), kidney-shaped, beaked, black and shining. Embryo within fleshy albumen in the beak of the seed, curved and roundish; cotyledons linear, radical above, centripetal. —Sloane, Jam. ii. t. 191, f. 2; Swartz, Lin. Trans. i. vol. viii. p. 102; fructif. Gærtner, i. 373, t. 77.

Prop.—The Bark, being the only officinal part, is removed with an iron instrument, and then, being deprived of its epidermis, is dried in the shade. It is in flat or quilled pieces, according to the part of the tree from which it has been removed, the thinner pieces drying into the quill form most readily. (Goebel and K. I. tab. iii. fig. 1–3.) The pieces are of a light buff colour, paler internally; have an aromatic odour, a warm pungent taste, and are brittle, yielding a yellowish-white powder. Boiling water takes up some of this bark, but Alcohol only dissolves its aromatic properties, becoming of a bright yellow colour. Distilled with water, it yields a reddish-yellow, fragrant, and very acrid Essential oil, which is often mixed with and sometimes sold for Oil of Cloves. (*Browne.*) Petroz and Robinet also obtained an aromatic Resin, Bitter Extractive, a peculiar Saccharine substance, which will not undergo the vinous fermentation, and which has been called *Canellin*, Albumen, Gum, Starch, Lignin, and Salts. It may be distinguished from Winter's Bark by not being precipitated by Nitrate of Baryta, nor by infusion of Galls,—nor by Sulphate of Iron, as it does not contain Tannin.

Action. Uses.—Aromatic, Stimulant. Adjunct to tonic and purgative compounds. Used as a spice in the West Indies. Contained in Vinum Rhei.

Dose.—Gr. x.–gr. xxx. of the powder.

The HIPPOCASTANEÆ contain *Æsculus Hippocastanum*, or the Horse-chestnut, which, being bitter and astringent, was at one time officinal, and employed as a tonic and febrifuge.

The MELIACEÆ, a tropical family, distinguished by the filaments of the stamens being united into a tube, contain many plants possessed of medicinal virtues. *Soymida febrifuga*, the *rohuna* of India, at one time officinal in the E. P., is a powerful East India febrifuge; so also species of *Khaya*, of *Cedrela*, of *Melia*, of *Heynea*, and of other genera, are employed for the same purposes in the countries where they are indigenous.

AMPELIDEÆ, *Kunth.* (VINIFERÆ, *Juss.*) Vineworts.

The Ampelidæ, so called from *αμπελος, ampelos*, a vine, are also sometimes called Vites and Vitaceæ, but these names are too similar to Vitex and to Vitices. They abound in the tropics, chiefly of Asia; a few are found as far north as 30°, and still higher in North America. The species abound in acid, with astringent or coloured juice, which is more or less grateful. The saccharine secretion of the Grape makes it highly esteemed as a fruit.

VITIS VINIFERA, *Linn.* The Grape-vine. *Pentandria Monogynia,* Linn. Uvæ; Raisins; the dried or prepared fruit, B. *Uvæ passæ.*

The vine was early cultivated in Egypt, Palestine, and Greece. It is probably a native of Persia. It is found wild about Tinkaboon in Deilum, about N. lat. 37°, on the southern shores of the Caspian (Royle, *Him.* p. 146). Humboldt also states that it grows wild on the coasts of the Caspian Sea, in Armenia, and in Caramania.

The Vine, like other cultivated plants, varies much in its growth and in the quality of its fruit. It sometimes attains a great size, climbing to the tops of the highest trees in Italy and in Cashmere, and lives to a great age, some vineyards being three or four hundred years old.

The Grape-vine is distinguished among the species of Vitis by having its leaves lobed and sinuato-dentate, naked or tomentose. The calyx is obscurely 5-toothed. The coral composed of 5 petals, cohering at the apex, and like a calyptra splitting at the base and falling off together. Stamens 5. Style wanting. Berry 2-celled, 4-seeded, cells and seeds often abortive. The great diversity in form has been summed up by De Candolle in the following words:—"The leaves are more or less lobed, smooth, pubescent or downy, flat or curled, pale or deep green. Branches prostrate, climbing or erect, tender or firm.

Bunches loose or crowded, ovate or cylindrical; the berries red, greenish, or white, watery or fleshy, globose, ovate or oblong, sweet, musky, or austere. Seeds often varying in number, or fruit seedless."

Of the Grape-vine there are numerous varieties cultivated in different countries, as well as in the hot-houses of England. When unripe, the fruit is remarkable for the harsh acidity of its juice, which is then called *verjuice.* It owes this property to a little free Citric, Malic, and Tartaric acids, and to the Supertartrate of Potash. It also contains some Tannin and Extractive, some Sulphates of Potash and of Lime, also Malate and Phosphate of Lime. This juice used to be employed in medicine, and still is used for making syrups and sherbets. Lieutenant Burnes mentions that in Caubul they use grape-powder, obtained by drying and powdering the unripe fruit, as a pleasant acid.

Grapes as they ripen lose their acid taste, becoming sweet and delicious in flavour. They are wholesome as fruit, both to the sick and to those in health; allaying thirst in febrile affections, and being pleasant nutritious articles of diet. But they are a little acid from containing Citric′ and Malic′, and Supertartrates of Potash and Lime. The sweetness is owing to the formation, at the expense of the acids, of some *Grape-Sugar* or Glucose, which differs from Cane-Sugar in being granular and not presenting crystalline faces, in being less sweet, and less soluble both in water and in Alcohol; differing also in its refractive powers. Composed of $C_{12}H_{12}O_{12} + 2HO$. When grape-juice undergoes fermentation, this sugar is converted into Alcohol and Carbonic acid. Grape-juice also contains Gum, Extractive, Colouring matter, and a Glutinoid substance of the nature of ferment or yeast. This juice, when expressed, is called MUST (Mustum).

RAISINS. *Uvæ passæ.*—Grapes in their dried state are well known as Raisins, and are prepared by being dried in the sun or in ovens, or by steeping them in a weak alkaline ley formed from the ashes of the burnt tendrils. Some are prepared by partially cutting the stalk of the bunches before the grapes are quite ripe, and allowing them to dry upon the vine. They are chiefly prepared in Spain and in the Levant, hence called Valentias and Smyrnas; also in Affghanistan, whence they are taken to India. The best are the Muscatels, from the grape of that name. The Sultanas, like the *Bedanas* of the East, are without stones. The Malaga Raisins are large and fleshy, of a purplish-brown colour. Those of Calabria are similar. The Smyrna Raisins are of a yellowish-brown colour, slight musky odour, less sweet and agreeable than the former. The Corinthian Raisins, or, as they are commonly called, Currants, are produced by a small-sized grape which is abundant in the Ionian Islands.

Raisins differ from Grapes in containing less water and acid, and more Sugar. Besides their dietetical uses, they are demulcent, and are employed for improving the flavour of several officinal compounds (as below), also for demulcent beverages. Though nutritious, they are apt to be indigestible.

The juice of the Grape, expressed and allowed to ferment, yields Wine, Alcohol, and Vinegar. These will be treated of as the products of fermentation at the end of the Vegetable Materia Medica. The Lees of the Wine, moreover, yield Tartar, that is, impure Cream of Tartar.

Tartar, or impure Supertartrate of Potash, enumerated above as one of the constituents of the juice of the Grape, has already been treated of at p. 97, where it is mentioned that as the Saccharine matter disappears and becomes converted into Alcohol, this salt, being insoluble in the Spirit formed, is deposited in the casks, and well known by the name of *argol* or *tartar*. This is chiefly composed of Supertartrate of Potash with a little Supertartrate of Lime. Besides its own particular uses (*see* p. 98) it is important as the salt from which Tartaric acid is obtained.

ACIDUM TARTARICUM, B. Tartaric Acid.

Tartaric acid, so named from Tartar, is contained in the juice of the Grape, as also in Tamarinds and in some other acidulous fruits. Tartar, which in its purified state is so well known as Cream of Tartar, consists of 1 equivalent of the Bibasic Tartaric acid, in combination with 1 of Potash and 1 of water, thus forming a Supertartrate (*Bitartrate*) of Potash (*see* p. 97). The chemical process adopted in preparing Tartaric acid is divisible into two stages; in the first of which half the acid of the Cream of Tartar is separated in the form of Tartrate of Lime; and in the second the other half is precipitated, also as Tartrate of Lime.

Prep.—Boil *Acid Tartrate of Potash* ℥xlv., with Cij. of *Dist. water*, and add gradually *Prepared Chalk* ℥xijß., constantly stirring. When the effervescence has ceased, add *Chloride of Calcium* ℥xijß., dissolved in Oij. of *Water*. When the tartrate of lime has subsided pour off the liquid, and wash the tartrate with *Distilled water* until it is rendered tasteless. Pour *Sulphuric acid* ℥xiij., first diluted with Oiij. of *Water*, on the Tartrate of Lime, mix thoroughly, boil for half an hour with repeated stirring, and filter through calico. Evaporate the filtrate at a gentle heat until it acquires the specific gravity of 1·21, allow it to cool, and then separate and reject the crystals of sulphate of lime which have formed. Again evaporate the clear liquor till a film forms on its surface, and allow it to cool and crystallise. Lastly, purify the crystals by solution, filtration (if necessary), and recrystallisation. (It usually requires crystallisation 2 or 3 times, and to be purified with animal charcoal, before the crystals can be obtained in a pure state, and free from colour.)

This process is thus explained. On the first addition of Chalk, 2 eqiv. of the Supertart. Potash (KO, HO, T') react upon 2 of Carb. Lime (Ca O, CO_2). One equiv. of Tartaric′ unites with 2 KO, forming the neutral bibasic Tartrate of Potash, which is dissolved; the other combines with the 2 Ca O, to form a similar neutral Tartrate of Lime, which, being insoluble, is precipitated. The Carb. acid of the Chalk escapes with effervescence—

$$2\,(KO, T, HO) + 2\,(Ca\,O, CO_2) = 2\,KO, T + 2\,Ca\,O, T + (2\,CO_2 + 2\,HO).$$

In the second place, Chloride of Calcium is added in solution, and 2 eqiv. of this salt react on the 1 equiv. of Tart. Potash (2 KO, T) which remains dissolved. 2 K unite with 2 Cl to form 2 eq. of Chloride of Potassium, which are dissolved: while the 2 O of the Potash join the 2 Ca to form Lime—the 2 eq. of which combine with the Tart. to form a second portion of Tart. Lime, which again precipitates—

$$2\,KO, T + 2\,Ca\,Cl = 2\,K\,Cl + 2\,Ca\,O,\ T.$$

The Tartrate of Lime, being separated, is decomposed by Sulph. Acid. An insoluble Sulphate of Lime is formed, the whole of the Tartaric acid remaining alone in solution.

When Tartaric acid is made on the large scale, the materials for its preparation—Water, Tartar, and Whiting—are mixed in a large vat or generator, the contents of which are heated by steam, and kept in motion by an iron stirrer. The Carb. acid gas is carried off by a pipe above, and employed in the preparation of Bicarb. Soda (q. v.) In the second stage of the process, Sulphate of Lime, which is cheap, is generally used instead of the Chlor. Calcium. The heat and agitation being renewed, the decomposition is the same as above, only that Sulph. Potash is obtained in solution, and subsequently employed for various purposes. When the Tart. Lime is decomposed by Sulph. acid, Sulph. Lime is again obtained, and again employed as before. (P. J. x. 398.)

Tartaric acid, discovered in 1770 by Scheele, is colourless, without smell, and pleasantly sour. Its crystals are large, clear, and more or less modified from their primary form, the oblique rhombic prism. They are permanent in the air, soluble in five or six times their weight of water at 60°, and in twice their weight at 212°; less so in Alcohol. The solution decomposes in keeping, a light and thin membranous-like matter being formed. The effects of heat, of acids, &c., are remarkable in producing a number of new compounds. When heated to about 400° it melts, loses one-fourth of its water, becomes deliquescent, and forms what has been called Tartralic′. A further degree of heat produces Tartrelic′, an anhydrous Tartaric′, which is insoluble and powdery. When subjected to destructive distillation, Carbonic acid and water are given off, and two pyrogenous acids are produced. One of these, the Pyrotartaric, is oily, and the other crystalline. A solution of Tar′ added to solutions of the earthy salts, will form white precipitates, as of Lime, Strontia, and Baryta, soluble in excess of acid. With the Acetate of Lead and Nitrate of silver it also forms white Tartrates of these metals. It is most easily distinguished from other acids by a soluble salt of Potash (as the Acetate), with which on addition it precipitates a Supertartrate of Potash, either as a powder or in crystals, according to the state of dilution. It is a Bibasic acid, and remarkable for forming double salts, of which the Tartrates of Potash and Soda, of Potash and Antimony, of Potash and Iron, are officinal. Comp. $C_8 H_4 O_{10} + 2$ Aq. (*Liebig.*)*

Tests.—Tar′ is apt to be adulterated with Bitartrate of Potash or with Lime. It should be colourless. Almost or entirely destroyed by heat. Soluble in water. The solution precipitates the Bitartrate from any neutral salt of Potash (Citric acid does not). Nothing is precipitated from it by H S; by Chlor. Barium (test for Sulphates); by solution of Sulphate of Lime (Oxalic Acid), or Oxalate of Ammonia (Lime). 75 *gr.*=1000 *measures volumetric sol. Soda* (B).

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* According to M. Bouchardat, Tartaric acid resembles Sugar in giving off an odour of Caramel when thrown on burning coals, in emitting an electric light when pounded in a mortar in the dark, and in being able to rotate the plane of vibration of polarised light. Neither of the last two properties is possessed by Citric acid. (P. J. ix. 72.)

Inc.—Alkalies, Earths, and their Carbonates; salts of Potash, of Lime, and of Lead; Nitrate of Silver.

Action. Uses.—Refrigerant. Being cheaper, it is often used as a substitute for Citric acid, especially in making effervescing draughts, its saturating power being nearly the same. The common Soda Powders are made with Tar′ gr. xxv. and Bicarb. Soda gr. xxx. kept in separate papers, dissolved in water, and mixed at the time of being taken in a state of effervescence. So also the gentle aperient Seidlitz Powders are formed with Tartrate of Potash and Soda gr. cxx., Bicarb. of Soda gr. xl., dissolved in water and taken in effervescence with Tartaric acid gr. xxx. Bisulphate of Soda has been fraudulently sold, under the name of "Common Tartaric acid," for use in the gazogene apparatus.

OXALIDEÆ, *Dec.* Oxalids.

The Oxalideæ abound in tropical America and at the Cape of Good Hope. A few, and those most widely diffused, are found in temperate and warm parts of the world. Averrhoa in India and the Indian Islands. The herbaceous parts of many of the species, and the fruits of others, are acidulous from the presence of Binoxalate of Potash. The tubers of the stemless species abound in fecula, and are esculent.

OXALIS ACETOSELLA, *Linn.* Wood-Sorrel. *Decand. Pentagyn.*

This elegant little plant is found throughout Europe in shady situations. It is distinctly noticed from the time of Charlemagne, and is supposed to have been known to the Alexandrian school. Mr Bicheno considers it to be the true Shamrock. It is not now officinal.

It obtained its ancient name of Oxys (*Pliny*) from οξύς, *acid taste.* It is, like the common sorrel, of an agreeably acid taste, but harsh to the teeth when chewed, owing to the presence of Binoxalate of Potash, which is secreted by this and several other plants, as by *Rumex acetosa*, the species of *Rheum*, and especially by *Cicer arietinum*. It is refrigerant and Antiscorbutic.

ACIDUM OXALICUM. Oxalic Acid. *Acid of Sugar.*

Oxalic acid ($C_2\,O_3, H\,O + 2\,Aq. = 63$ when crystallised) has obtained its name from the foregoing plant. It is said to be contained in a free state in *Cicer arietinum*, but is probably in the state of Binoxalate. It is acid and powerful enough to blanch the boots in walking through a field of the plant. Some Lichens contain a very large proportion of Oxalate of Lime. It is now obtained in the largest quantities from the action of Nitric acid on several substances of the nature of Sugar and Starch, including these substances themselves. Hence it has been called Acid of Sugar. The Nitric′ becoming decomposed, these substances lose their Hydrogen, become oxidised, and converted into an acid, which is found to be composed of 2 Eq. of Carbon united with 3 of Oxygen. This is soluble in about its own weight of hot, and in about 8 times its weight of cold water, the solution being intensely acid. It readily crystallises in quadrangular crystals, which are colourless and transparent, elongated, six-sided, and flattened, with two or four terminal planes, being derived from an oblique rhombic prism. The crystals effloresce in a dry atmosphere, and melt in their water of crystallisation, are volatilised by heat, decomposed at a higher temperature, and with the aid of Sul′, into water, Carb′, and Carbonic oxide. Their acidity is powerful, acrid, and corrosive: hence the acid is a virulent poison. Numerous fatal cases have occurred from the resemblance of its crystals to Epsom Salts. But they may readily be distinguished by their crackling noise when dissolving in water; by the intensely acid taste and reaction of the solution; by its effervescing with the alkaline Carbonates, which give a white precipitate with Epsom Salts or Sulphate of Magnesia (p. 141). This is, moreover, distinguished by its nauseously bitter taste. The crystals of Ox′ also resemble those of Sulphate of Zinc (p. 180). Oxalic′ is distinguished by its powerful affinity for Lime, separating it even from Sulphuric′. The Oxalate of Lime formed is insoluble in an excess of acid. A soluble Oxalate will be detected by the solution of a neutral salt of Lime or of Oxide of Lead. The acid may be separated from the Lead by the action of sulphuretted Hydrogen; and then being filtered and evaporated, it will crystallise. Insoluble Oxalates, the bases of which form insoluble compounds with Sul′, may be decomposed by the action of this acid, when the Ox′ will be separated.

Action. Uses.—A virulent Poison, which is very speedy in its action. Acute pain is immediately experienced, followed by vomiting. Great depression of the circulation ensues, nervous symptoms, such as great debility, numbness, &c., sometimes followed by convulsions. "But death follows so speedily after the injection of large doses,—few of those who have died survived above an hour,—that the symptoms have not been fully made out." (*c.*) Irritation and corrosion of the stomach are observed.

Antidotes.—Chalk, Whiting, or Magnesia mixed up with water should be administered as quickly as possible in large quantities. Evacuate the stomach. Large quantities of water may be also useful.

Binoxalate of Potash ($KO, 2\,C_2O_3 + 2\,Aq. = 137$), the salt which is contained in Wood-Sorrel and other plants, is often called *Salt of Sorrel* or *of Wood-Sorrel*, and very absurdly *Essential Salt of Lemons.* It may be obtained from the juice of the plant by evaporating and then redissolving, and subsequently crystallising; or by neutralising a portion of Oxalic acid with Carb. of Potash, and then adding an equal quantity of Ox′, when the salt is obtained in colourless rhombic prisms, having a sour taste, and requiring 40 parts of water for their solution. This salt may be used for the same purposes as the plant itself; but in large doses will act as a poison.

Quadroxalate of Potash ($KO, 4\,C_2O_3 + 7\,Aq. = 254$) is usually sold in the shops for the above salt, being much used for removing iron-moulds and ink-stains. It may be made by a process similar to that just mentioned, but adding 3 more parts of Oxalic′ to the Oxalate.

AMMONIÆ OXALAS (B., Appendix). Oxalate of Ammonia.

Prep.—Dissolve *Oxalic acid* in water, neutralise with *Carb. Ammonia*, filter cool, and crystallise.

Comp. ($N\ H_3,\ C_2O_3 + 2\ H\ O$).
Used only as a test for Lime. (Test solution, B, ℥ß in Oj.)

ZYGOPHYLLEÆ, *R. Brown.* Beancapers.

They abound in warm extratropical parts of the world. Some of the species of Guaiacum have their bark and wood abounding in resin, possessed of stimulant properties. Others of the species have a disagreeable odour.

GUAIACUM OFFICINALE, *Linn.* Officinal Guaiacum tree. *Decandria Monogynia*, Linn.

Guaiaci Lignum, the wood, B.
Guaiaci Resina, B. Resin obtained by exudation, incisions, or heat, from the stem.

Guaiacum was made known in Europe by the Spaniards, about the year 1508 (*Monardes*, c. xx.), having been previously employed in medicine by the natives of the West Indies and of South America where the species are indigenous, and called *Guayacan.*

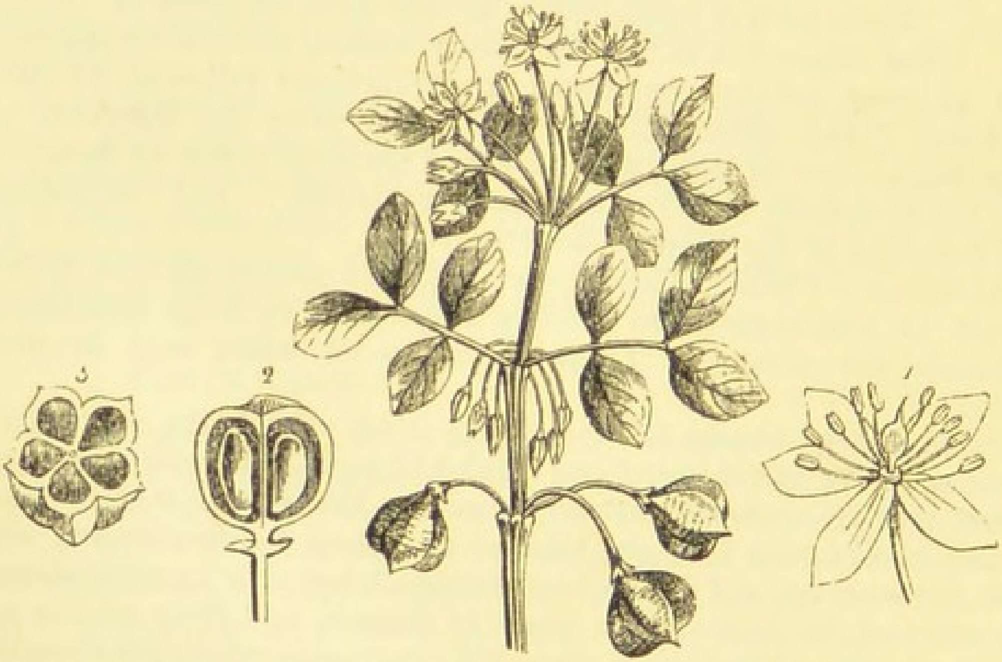

Fig. 51.

The officinal Guaiacum (fig. 51) is a large evergreen tree, from 40 to 60 feet in height, with deep penetrating roots, and of a dark gloomy aspect. The wood is hard, heavy, of a greenish colour, and remarkable for the direction of its fibres, being cross-grained; the strata running obliquely into one another in the form of an X (Browne, 1789), or obliquely at an angle of 30° with the axis. The leaves are opposite, abruptly pinnate, with 2, sometimes 3 or 4 pairs of leaflets; these are smooth, obovate, or oval obtuse, delicately veined. The flowers are borne on long single-flowered peduncles, 8 or 10 generally rising together from the axils of the upper pairs of leaves. The calyx is 5-partite, segments obtuse, a little velvety. Petals 5, oblong, spreading, of a light-blue colour. Stamens 10 (fig. 1,) with their filaments a little broader towards the base. Style and stigma simple. The fruit is a fleshy capsule of a reddish-yellow colour, slightly pedicelled, almost truncate at the apex, 5-angled, 5-celled (fig. 3), or from abortion 2–3 celled. Seeds solitary in each cell, pendulous from the axis (fig. 2), radicle superior, cotyledons somewhat fleshy. Albumen cartilaginous. A native of the West India Islands, particularly Cuba, St Domingo, and the south side of Jamaica, flowering in April, and ripening its seed in June.—*Sloane*, Hist. t. 222, f. 3. Bot. Reg. new ser. xii. t. 91.

G. sanctum, Linn., a native of Porto Rico, and *G. arboreum*, Humboldt and Bonpland, *Guayacan* of the natives of Cumana and Carthagena, are said to yield some of the Guaiacum wood, or Lignum Vitæ of commerce, which is also obtained from the Isthmus of Darien.

GUAIACI LIGNUM, B. Guaiacum Wood.—Known in commerce by the name of Lignum Vitæ, is imported in great logs generally without, but sometimes covered with, a smooth grey bark, from Jamaica, Cuba, St Domingo, &c. It is remarkable for its weight (Sp. Gr. 1·33), hardness, and toughness, and is therefore much used in machinery, also for rollers, pestles and mortars, &c. It is distinguished by its cross-fibre (see *supra*), and is surrounded with the alburnum or *sap-wood*, which is smooth, hard, and yellow, like box; while the *heart-wood* is of a dull brownish-green colour, from containing a large proportion of Guaiac. It is usually met with in shops in the form of shavings and turnings, which are, however, apt to be intermixed with those of other woods, as of box. The sawdust of Guaiacum is stated by Richard to become green by exposure to the air. It is turned to a bluish-green by the action of Nitric' or its fumes. But the cross-fibre should also be looked for.

The Bark, which is of a dark-greenish colour with greyish spots, has sometimes been used officinally. It is acrid in taste, and has been thought by some to be as efficacious as the wood.

The wood is without smell, except when rubbed or heated; it has a slightly bitter and pungent taste, chiefly affecting the throat. It burns readily, even when the corner of a block is presented to a flame. It yields its virtues partially to water, a decoction becoming yellow in colour and acrid in taste. Geiger, from ℔j. of the wood, obtained ℥ij. of an aqueous extract. Hagen obtained 3 per cent. of Guaiacum resin from the wood. It contains both an acrid principle and resin. "The former abounds most in the alburnum, the latter in the central wood: the more acrid alburnum ought perhaps to be preferred." (*c.*)

Brown states that all parts of the plant are possessed of active properties, the fresh bark being aperient and a purifier of the blood; the pulp of the berries emetic and cathartic; the leaves detergent, and employed in cleaning house-floors, and for washing linen.

Pharm. Prep.—Decoctum Sarsæ Compositum.

GUAIACI RESINA, B. GUAIACUM.—Resin of Guaiacum, or Guaiac (*Gum Guaiacum*), is the concrete juice of the tree, and is usually thought to be the only active part, even of the wood. According to Browne, it transudes frequently of its own accord, and may thus be seen concreted on the bark at all seasons of the year, but in greater abundance when the bark has been cut or wounded. It is also obtained by heating in the fire billets of the wood which have been bored longitudinally, and receiving in a calabash the melted Guaiac at the other end. A third way of preparing it is by boiling the chips in salt and water, and skimming off the Guaiac, which rises to the surface.

Guaiac may be seen in grains, sometimes agglutinated, but usually in homogeneous lumps, Sp. Gr. 1·2 to 1·23; but sometimes mixed with pieces of the wood and bark; of a brownish-green colour, sometimes with a tinge of red; fracture brilliantly shining, glass-like, and resinous, brittle; powder at first of a greyish colour, but generally becoming green when exposed to light. It softens in the mouth; the taste, at first scarcely perceptible, is slightly bitter, but becoming acrid, it produces burning in the fauces. The odour is slight, increased on pounding, or on heating it, when it melts and evolves a balsamic odour. Water has but moderate action on it, dissolving about 9 per cent., chiefly Extractive. The fixed and volatile oils scarcely act upon it. Alcohol dissolves 91 per cent. of the resinous substance called Guaiac, becoming of a deep-brown colour. The Guaiac is precipitated on the addition of water, S′ and H Cl. Ether also dissolves the resin. This resin has the nature of an acid; it is called *Guaiacic acid*, and forms soluble salts with alkalies. Solutions of Potash and Soda dissolve it freely, as does Ammoniated Alcohol. Sul′ becomes of a rich claret colour; Chlorine produces remarkable changes of colour in the Tincture, from green to blue, and from that to brown, finally converting Guaiac into Oxalic acid. Nitric acid does the same. The changes of colour seem, as above, to be dependent on the absorption of Oxygen.

Dr Schmidt makes use of this property as a test to ascertain the presence of Guaiacum as an adulteration in the resins of Scammony and Jalap. If an alkaline solution of one of these be added to a solution of Hypochlorite of Soda, it is said to assume a green colour if only $\frac{1}{320}$th part of Guaiacum be present. (P. J. xi. 523.)

The Tincture imparts a blue colour to Gluten, and to substances containing it; also to mucilage of Gum Arabic made with cold water, and to transverse sections of various roots: hence the B. P. employs slices of the raw Potato as a test of its purity. The colour is produced most near the eyes and about the skin of this tuber, at which parts the Gluten, or Albuminous matter, abounds. Mere Starch will not produce it.

Guaiac consists evidently of an extractive-like matter, which is taken up by water, and of the acid Resin, which, having peculiar characters, is called Guaiacic acid. Unverdorben considers this to be composed of 2 Resins ; one is soluble in Ammonia, and the other, which forms the largest portion of Guaiac, merely mixes with it. M. Thierry has, by means of Ether, separated from the watery extract of Guaiacum what he calls Balsamic Resin, and from it obtained an acid which he calls Guaiacic acid, and which resembles Benzoic and Cinnamic acids, but differs from them in being perfectly soluble in water. Besides the Balsamic Resin, the extract, he states, contains another resin, which is soluble in Ammonia.

Dr Ure, in an ultimate analysis of Guaiacum, found it composed of Carbon 67·88, Hydrogen 7·05, Oxygen 25·07=100. Professor Johnston considers the composition of the resin to be $C_{40} H_{23} O_{10}$, and its Eq. 343.

Tests.—Fresh fracture red, slowly passing to green ; the tincture slowly strikes a clear blue colour on the inner surface of a paring of raw potato.

Action. Uses.—Acrid Stimulant and Alterative, Diaphoretic. In large doses, irritant of the intestinal canal. Useful in chronic Rheumatism, Secondary Syphilis, Scrofula, and in chronic Skin Diseases.

Dose.—Gr. x.–gr. xxx. in powder or bolus, or in the following mixture.

MISTURA GUAIACI, B. Guaiacum Mixture.

Prep.—B. Triturate *Resin of Guaiacum* in powder ℥ß, with *Sugar* ℥ß, and powdered *Gum Arabic* ℥¼, lastly add gradually *Cinnamon Water* Oj.

An emulsion is formed with the aid of the Sugar and Gum, in which all the constituents of the Guaiacum are suspended. It may be given in doses of f℥ß–f℥ij. 2 or 3 times a-day.

A *Decoction of Guaiacum Wood* was officinal in the E. P. It resembled the old *Decoction of the Woods*, and the *Dec. Sarsæ Comp.* B. is very similar. Prescribed in doses of f℥ij.–f℥iv., it is useful in producing a diaphoretic effect in cases of chronic Rheumatism, &c., the patient being kept warm to favour the determination to the skin.

An *Extract of Guaiacum* is ordered in the French Codex, in which the *wood* is thrice boiled in *Aq. Dest.;* this allowed to stand for 12 hours to deposit, decanted, and evaporated to a soft consistence, the deposit being then mixed, and about an eighth part of Alcohol added towards the end of the process.

TINCTURA GUAIACI AMMONIATA, B. Ammoniated Tincture of Guaiacum.

Prep.—B. Macerate for 7 days *Resin of Guaiacum* in fine powder ℥iv., in *Aromatic Spirit of Ammonia* ℥xv., filter. Add *Aromatic Spirit of Ammonia* to make Oj.

Action. Uses.—Ammoniated Alcohol being an excellent solvent for Guaiacum, this Tincture has been much employed in chronic Rheumatism, &c., and is considered very efficacious. It must be given in some viscid fluid.

Officinal Preparations containing Guaiacum. Resin. Pil. Hyd. Subchlor. Comp. B. (p. 225.) *Wood.* Decoctum Sarsæ Comp. B.

RUTEÆ, *Adr. Juss.* Rueworts.

The Ruteæ are inhabitants chiefly of the temperate parts of the Northern Hemisphere. They secrete a volatile oil with bitter matter.

RUTA. Ruta graveolens, *Linn.* Common or Garden Rue. *Decand. Monog.* Linn.

The common Rue, and *Ruta angustifolia*, both natives of the south of Europe, were much employed and highly esteemed by the ancients, as they still are by Asiatic nations.

R. graveolens is a small branching under-shrub about 2-3 feet high. Stems straight, slightly striated, of a dull greenish colour. Leaves of a glaucous green, supra-decompound, leaflets thickish, dotted, oval oblong, tapering towards their bases, the terminal one obovate. Flowers in a terminal corymb. Calyx small, 4-fid, rarely 5-fid. Petals 4, in the upper flowers 5, yellow, oval, unguiculate, entire or denticulated, with their apices curved inwards. Stamens 8 or 10. Ovary marked with 2 crucial furrows. Capsule globular, warty in 4 or 5 obtuse lobes, each separable into two valves. Seeds dotted.

Every part of the Rue is distinguished by a strong and repulsive odour and an acrid and bitter disagreeable taste. The leaves have the strongest odour when the seed-vessels are well developed, but still green. A great portion of their peculiar characters is necessarily lost in drying. The unripe fruit is also used as a source of the oil, because the seed-vessel is covered with large oil-vesicles, which impart great activity to this organ.

Action. Uses.—Rubefacient, Stimulant, Antispasmodic, Emmenagogue, Anthelmintic. Supposed by the ancients to strengthen the eyes, and to be an antidote to Hemlock.

OLEUM RUTÆ, B. Oil of Rue; distilled (in England) from the fresh herb.

Distilled with water from the herb, flowers, and half-ripe ovaries of common Rue. It is of a light-yellow colour, acrid in nature, and with a very disagreeable smell.

Action. Uses.—Stimulant, &c. Used as an Antispasmodic and Emmenagogue.

Dose.—♏ij.-♏v. rubbed with Sugar and water.

[CONFECTIO RUTÆ, L. Confection of Rue.

Prep.—Rub together into a very fine powder *freshly bruised Rue, Carraway, Bay Berries,* āā ℥jß., with *Black Pepper*, ʒij.; then let *prepared Sagapenum* ℥ß, and *Honey* (despumated) ℥xvj., liquefy over a slow fire with *Dist. water*, q. s.; add the powder gradually to it, and mix all together.

The dried herb is less efficacious than when fresh. The Rue being combined with substances having similar properties, this confection is sometimes useful in flatulent colic in doses of gr. xx.–lx.]

The *Syrup of Rue*, though not officinal, is kept by most druggists. It is made by dissolving *Oil of Rue* ♏xij. in *Rectified Spirit* ʒiv., and then mixing with *Simple Syrup* Oj.

Dose.—Often given by nurses, in 2 doses of ½ to 2 tea-spoonfuls in the flatulent colic of children.

DIOSMEÆ *Adr. Jussieu.* Diosmads.

The *Diosmeæ* are closely allied to Zanthoxyleæ, and also to Ruteæ, with which they are indeed usually united, and are to be distinguished from them chiefly by the endocarp in the ripe capsule. They are found in South Africa and in New Holland, some in tropical America, and a few in equinoctial Asia, with only Dictamnus in the North of Asia and the South of Europe. They secrete volatile oil and Resin, as well as a bitter principle.

BUCHU FOLIA, B. Buchu. The dried leaves of Barosma betulina, *Bartl.* and *Wendl.*, Barosma serratifolia, *Willd.*, and B. crenulata, *Willd.* *Diosma.* *Pentandria Monogynia*, Linn.

The leaves of one or more plants called *Buchu*, *Bucku*, *Bookoo*, having been found by Mr Burchell, the African traveller, to be employed by the Hottentots as a vulnerary, and in the treatment of diseases of the urinary organs, became known in this country about the year 1823. Bucku was first introduced into the D. P., and then into the L. P. as the leaves of *Diosma crenata.* Sir W. Hooker, however, showed in the Bot. Mag. t. 3413, that the leaves of *D. crenulata* are the most common, and that those of *D. serratifolia* are also found in commerce. All these species have since been restored to the genus BAROSMA, to which they originally belonged. "Several species are collected by the Hottentots, according to Thunberg, especially *B. betulina* and *pulchella*, and even *Adenandra uniflora*, to which some *Agathosmas* and many others may no doubt be added." (*Lindley*, Fl. Med.) These are all included in the genus Diosma by De Candolle (Prod. i. p. 713). The leaves are imported from the Cape of Good Hope.

BAROSMA.

Calyx 5-fid or 5-partite (1). Petals 5, inserted into the base of the disk, which lines the bottom of the calyx, and has a short, scarcely prominent rim. Stamens 10, inserted with the petals and equal to them in length, 5 fertile alternating with the petals, filaments filiform, subulate, with the anthers commonly terminated by a small gland, often becoming recurved, 5 opposite to and shorter than the petals, sterile, petaloid, indistinctly glandular at the apex. Ovaries 5, united into one, 5-lobed and auriculate at the apex, commonly with a glandular tubercle. Style longer than the stamens. Stigma minutely 5-lobed (2). Fruit (3) composed of 5 compressed cocci, outwardly auriculate and covered with glandular dots. Seed (4) oblong.—Shrubs of the Cape of Good Hope. Leaves opposite or alternate, leathery, flat, dotted (5), especially near the margin, varying in shape. Flowers axillary on single or 3-flowered peduncles, or fasciculate in single-flowered peduncles.

B. betulina. Fig. 52. (*Diosma crenata*, Dec.) Leaves ovate and obovate, acute, serrated, dotted glandular at the margin. Flowers pink, solitary and terminal, on somewhat leafy pedicels. Loddiges, Bot. Cab. i. 404.

B. serratifolia. (*D. serratifolia*, Dec. and Bot. Cab. t. 378.) Leaves linear-lanceolate, serrulate, smooth, dotted, glandular at the edges, three-nerved. Flowers white, on solitary lateral pedicels, bearing two leaflets above the middle.

B. crenulata, Willd. Hooker, B. M. t. 3413. (*D. crenulata*, Linn. *D. odorata*, Dec.) Leaves decussate, ovate, oblong, on very short petioles, very obtuse, minutely crenated, quite smooth and of a darkish-green above, beneath paler, with a few obscure oblique nerves, dotted with oil vesicles, with at every crenature a conspicuous pellucid gland and a pellucid margin round the whole leaf. Peduncles axillary and terminal, chiefly from the axils of the superior leaves, single-flowered, often bearing a pair of small opposite leaves or bracts above the middle. Beneath the calyx are 2 or 3 pairs of small imbricated bracts.

Buchu leaves are smooth, leathery, and shining, serrate or crenate at their margins, studded with dots, *i.e.*, vesicles filled with essential oil, of a light yellowish-green colour, of a strong, considered by some a disagreeable, odour; the taste warm and aromatic. They necessarily vary in form according to the species of plant from which they have been obtained. Those which are ovate or obovate are yielded by *B. betulina*, the linear-lanceolate ones by *B. serratifolia*, and those which are ovate, oblong, and obtuse, by *B. crenulata*. All may be found intermixed among the Buchu leaves of commerce. They contain Volatile Oil, which is of a yellowish-brown colour, and a penetrating odour, Bitter Extractive (*Diosmin*), Resin, Gum, Lignin, &c.

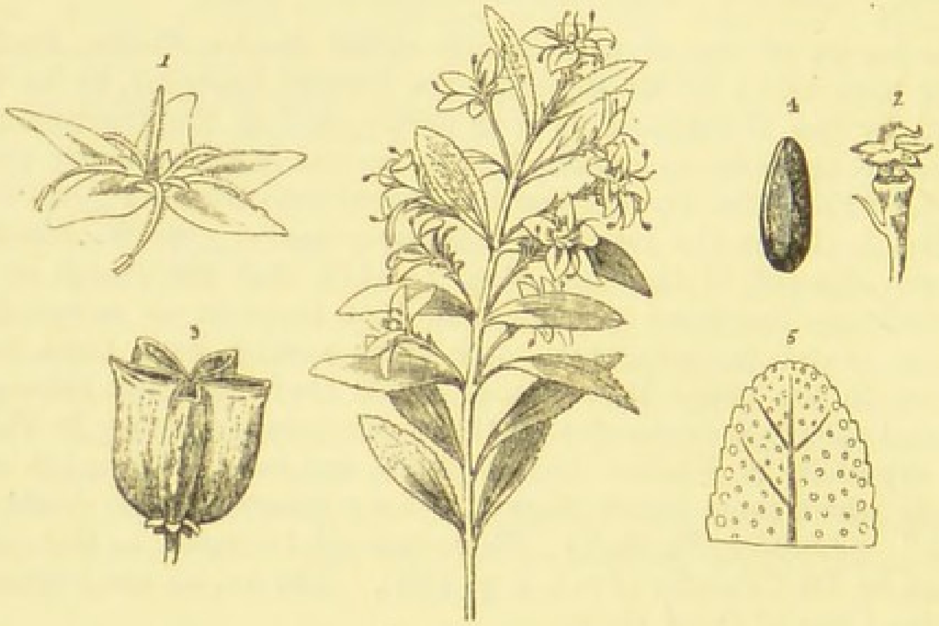

Fig. 52.

Action. Uses.—Stimulant and Tonic in chronic affections of the Urinary organs attended with increased secretion of Mucus, in doses of the powder, gr. xx.–gr. xxx.

INFUSUM BUCHU, B. Infusion of Buchu.

Prep.—B. Infuse *Buchu* bruised ℥ß in *Boiling Dist. water*, ℥x. in a covered vessel for one hour, and strain.

Action. Uses.—Tonic and Diuretic in doses of f℥jß 2 or 3 times a-day.

TINCTURA BUCHU, B. Tincture of Buchu.

Prep—B. *Buchu* bruised, ℥ijß.; *Proof Spirit*, Oj. Prepared as Tinctura Aconiti.

Proof Spirit is a good solvent for the active principles of Buchu.

Dose.—fʒj.–fʒiv.

Cusparlæ Cortex, B. Galipea Cusparia, DC. Cusparia Bark. Angustura.

Cusparia or Angustura Bark was introduced into England about the year 1788. It was subsequently ascertained that it was imported from Angustura on the Oronoco. Humboldt and Bonpland, in their travels in South America, having ascertained that the bark was called *Cusparé* by the natives, called the tree which they supposed yielded it *Cusparia febrifuga;* but having sent home specimens to Willdenow, he named it *Bonplandia*, in compliment to one of the travellers, and *trifoliata* from the number of its leaflets. Aug. St Hilaire having ascertained that, instead of being a new genus, it was only a new species of an old genus Galipea, named the tree *G. Cusparia*, which it still retains. Dr Hancock, however, who resided for some months in 1816 in the district where the Cusparia is produced, states that the above travellers did not themselves see the tree, but got branches of it without flowers from an Indian; that they afterwards thought they recognised the same plant, which they found growing in considerable forests. This Dr H. considers to be a distinct species of the same genus as the plant which yields Cusparia, and which he calls *Galipea officinalis.*

Galipea, *Aublet.* Pentand. Monog. *Linn.*

Calyx cup-shaped, 5-toothed, often 5-angled. Petals 5, united below into a tube, which is often pentangular. Stamens 5, rarely 6, 7, 8, or 4, with filaments adhering to the tube of the corolla, rarely all fertile, usually 2–4 with abortive anthers. Ovaries 5, connected, 1-celled, supported by an urceolar disk. Styles 5, distinct or connected at the base, each terminated by an obtuse pentangular stigma. Capsules by abortion 1 or 2.—Shrubs or trees. Leaves simple and ternate. Natives of Tropical America.

G. officinalis, *Hancock* (G. Cusparia, *Dec.*) A tree from 15 to 20 feet high, with smooth bark. Leaves alternate, trifoliate, petiole about the length of the leaflets, which are oval, but tapering towards both the base and apex, from 6 to 10 inches long, smooth, shining, when bruised smelling like tobacco. Panicles cylindrical, contracted, stalked, longer than the leaves, with the branches about 3-flowered. Calyx hairy. Petals white, downy, 2 longer than the others. Stamens 7, of which only 2 are fertile. Carpels villous as they ripen, 2-seeded, one usually abortive.—Neighbourhood of the Oronoco, between 7° and 8° N. lat. *Orayuri* of the natives, yields *Carony*, that is, *Cusparia bark*, exported from Angustura.

G. Cusparia (*S. Hilaire*). A forest tree, from 60 to 80 feet high, with fasciculate pubescence. Leaves alternate, trifoliate, long-stalked, leaflets sessile, unequal, ovate, lanceolate, acute, gratefully fragrant, with scattered glandular and pellucid dots. Flowers in axillary racemes, which are almost terminal. Calyx and corolla white with fascicles of hairs, seated on glandular bodies on the outside. Stamens 6, only 2 fertile. Anthers with two short appendages. Seed solitary.—Forests of tropical America, between Cumana and New Barcelona; yields Cusparia or Angustura bark (Cusparé of the natives) according to Humboldt and Bonpland.

Cusparia or Angustura Bark is in pieces some inches in length, from half to two inches in breath, and only one or two lines in thickness, more or less quilled, sometimes almost flat. It is covered with a thin, yellowish-white, mealy epidermis, smooth or wrinkled; the inner surface is rather smooth, but separable into splinters of a dull brownish colour; the substance of the bark is compact, and of a dark cinnamon colour. It is brittle, fracture short and resinous; powder of a greyish-yellow colour. The odour is strong and peculiar, the taste bitter, permanent, but slightly aromatic. It yields its properties to water and to Proof Spirit. Its properties depend on the presence of Gum, Resin, Volatile Oil, and a peculiar bitter principle. The Resin is a little acrid, as is also the Volatile Oil, which has the peculiar odour of Cusparia bark. The bitter principle or Extractive has also been named *Angusturin* and *Cusparin*, being a neutral principle, crystallisable in tetrahedrons, easily fusible, soluble in Rectified Spirit, in acids, and in alkaline solutions, precipitated of a whitish colour by Tincture of Galls, sparingly soluble in water, insoluble in Ether and the volatile oils, bitter in taste, and a little acrid.

Tests.—Cusparia Bark may easily be distinguished from other officinal barks, and is now seldom liable to adulteration. "The inner surface touched with Nitric acid does not become blood red." (B.) Some years since, several cases of poisoning occurred on the Continent from the substitution of what has been called *False Angustura Bark*, but which has been ascertained to be that of the *Strychnos Nux Vomica* (q. v.), and which Dr Neligan, at a later period, obtained as Angustura Bark at a druggist's in Dublin. The pieces of this are usually much thicker than Cusparia Bark, harder, more compact, covered with a ferruginous efflorescence, sometimes yellowish-grey, and marked with prominent white spots, without any aromatic odour, and having an intensely bitter taste. The inner surface and the transverse section become bright red when touched with Nit′, in consequence of this acting on the *Brucia* in the bark; and the rusty spots on the epidermis turn to a dark green when in contact with the same acid.

Action. Uses.—Stimulant Tonic, Febrifuge, Antidysenteric.

Dose.—Powder, gr. x.–gr. xxx. Extract, gr. v.–gr. xv.

INFUSUM CUSPARIÆ, B. Infusion of Cusparia.

Prep.—Infuse *Cusparia* in coarse powder ℥ß, in *Dist. water* at 120°, ℥x., in a covered vessel for two hours, and strain.

A stimulant and tonic in low states, in doses of f℥jß. It is of a dull orange colour. Sesquichloride or Sulphate of Iron produces in it a dark-greyish precipitate. Tincture of Galls produces a slate-coloured one; but no change is caused by Ferrocyanide of Potassium.

XANTHOXYLEÆ, made up chiefly of genera placed by De Candolle in *Rutaceæ* and *Terebinthaceæ*, are distinguished by their flowers being usually unisexual, by the calyx being free, petals hypogynous, equal in number to divisions of the calyx, ovaries subdistinct or united, each with two ovules, fruit indehiscent, carpels opening by a vertical suture, embryo in the axis of albumen. Many of the Xanthoxyleæ are remarkable for secreting a bitter principle, *Xanthopicrine*, and also a volatile oil of aromatic pungency. Thus several species of the order are employed as stimulants: one formed the *Faghureh* of Avicenna. The bark of *Xanthroxylum fraxineum*, the

Prickly Ash, is much used in North America as an aromatic tonic. The bark of the root of *Ptelea trifoliata*, the Shrub Trefoil, is used in the same country as a tonic in remittent and intermittent fever. (See papers by Professor Bentley in *Pharm. Journ. 2nd Series*, vol. iv.) Several species of Ptelea and Toddalia are bitter and febrifuge. Both the species of Brucea are likewise bitter and tonic. *B. antidysenterica*, the Woginos of Bruce, is most celebrated, because it was long supposed to yield the bark which was known as false Angustura, and from which the alkali *Brucia* was obtained; but the latter is now well ascertained to be the bark of *Strychnos Nux Vomica*.

SIMARUBEÆ, *Richard*. Quassiads.

The Simarubeæ are found in the tropical parts of America, with one species in the tropic-like forests at the base of the Himalayas, and a few simple-leaved species in tropical Asia and Madagascar. They are remarkable for their bitterness. Malombo Bark is thought to be a kind of Quassia.

QUASSIÆ LIGNUM, B. Wood of Picræna excelsa, *Lindl.*

Quassia Wood was first known in Europe about 1742, more fully in 1756, when Rolander returned from Surinam and gave some of the wood to Linnæus. The wood of *Quassia amara*, a native of Surinam, Guiana, and Panama, was first introduced into practice, and it was called Surinam Quassia; but the tree being of small bulk, and not very common, its place is supplied by the wood of *Picræna excelsa*. Mr Lance informed Dr Lindley that no Quassia had been exported from Surinam during the ten years he was at that place. Quassia is now imported from Jamaica. The wood, as received by Dr Pereira, is in cylindrical pieces about two inches in diameter, very light, covered by a thin greyish-white bark, all extremely bitter in taste. From its elegant pinnate leaves with winged footstalks, and its spike-like racemes of red flowers, this species is often cultivated as an ornamental plant in the West India Islands.

PICRÆNA EXCELSA, *Lindley*. Jamaica Quassia. *Polygamia Monœcia*, Linn.

This tree attains a height of 50, 60, or even 100 feet in the woods of the lower mountains of Jamaica and other West India islands, where it is called Bitter Ash and Bitter Wood, and its wood has for some time been substituted for that of the Surinam Quassia, and is sometimes called Jamaica Quassia. Dr Lindley has rightly formed it into a new genus, as it agrees with the characters neither of Quassia nor of Simaruba.

This tree, besides being lofty, is erect, often three feet in diameter, with a smooth, dark-grey bark. The wood is white, rather cross-grained, bitter, but without smell; the bark is moderately thick, dark-coloured, and wrinkled. Leaves pinnate, with an odd one. Leaflets opposite, 4 to 8 pairs, stalked, oblong acuminate, unequal at the base. The flowers are small, of a pale yellowish-green colour, polygamous, arranged in spreading pointed racemes, which are axillary towards the ends of the branches. The sepals are 5, minute Petals 5, longer than the sepals. Stamens 5, about as long as the petals, rather shaggy. Anthers roundish. In the male, merely the rudiments of the pistil in the female, ovaries 3, seated on a round tumid receptacle. Style 3-cornered, trifid. Stigmas simple, spreading. Drupes 3 (but only one coming to perfection), globose, 1-celled, 2-valved, distinct from each other, and placed on a broad hemispherical receptacle. When ripe about the size of a pea, black and shining, nut solitary, globose, with the shell fragile. (Lindley.)

Fig. 53.

Quassia-wood is imported in logs covered with a dark-grey bark smooth in the younger, rough and irregular in the larger pieces, yellowish-white and fibrous in the interior. The wood is yellowish-white and glistening; without smell, but of pure and intense bitterness; tough, and therefore pulverised with difficulty. It contains a bitter neutral principle, called *Quassine* ($C_{10}\ H_6\ O_3$), which is intensely bitter, crystalline, sparingly soluble in water and in Ether, readily dissolved by Alchol; also Gum, a little Volatile Oil, Lignin, salts with a base of Lime, an Ammoniacal salt, and some Nitrate of Potash.

Action. Uses.—A pure Bitter, useful as a Stomachic and Tonic.

INFUSUM QUASSIÆ, B. Infusion of Quassia.

Prep.—B. Macerate *Quassia* in chips, gr. lx., in *Cold Dist. water*, ℥x., in a covered vessel for half-an-hour, and strain.

Dose.—f℥jß 2 or 3 times a-day. A good vehicle for preparations of Iron.

EXTRACTUM QUASSIÆ, B. Extract of Quassia.

Prep.—Macerate *Quassia wood*, rasped, ℔j., in *Dist. water* ℥viij. for twelve hours. Then pack in a percolator, and add *Dist. water* until the *Quassia* is exhausted. Evaporate. Filter before it becomes too thick. Again evaporate by a water bath to a proper consistence for forming pills.

Dose.—In form of pill, gr. v., or as a vehicle for metallic tonics, &c.

TINCTURA QUASSIÆ, B. Tincture of Quassia.

Prep.—Take of *Quassia Wood*, in chips, ℥¾; *Proof Spirit*, Oj. Macerate for seven days in a closed vessel, with occasional agitation; then strain, press, filter, and add sufficient proof Spirit to make one pint.

Introduced in 1867 from E. P.
Dose.—fʒß–fʒij.

SIMARUBA. Radicis Cortex. Root-Bark. Simaruba amara, *Aublet.* *Monœcia* or *Diœcia Decand.* Linn.

This tree, of which the bark of the root was first introduced into practice in 1713, is a native of Guiana and Cayenne. The same species is found in the mountains of Jamaica, where it is called Mountain Damson.

The tree attains a height of 50 or 60 feet, and considerable thickness, with long horizontally spreading roots. The bark in the young parts is smooth and grey, in the older blackish coloured, and somewhat furrowed. The leaves are alternate, pinnate; leaflets alternate, 2 to 7 on each side, nearly sessile, oval, lanceolate, acuminate, tapering towards base, very smooth and entire, firm, coriaceous, of a deep-green colour; petioles sometimes a foot and a half in length. The flowers are monœcious, disposed in a mixed scattered axillary panicle. The calyx is short, cup-shaped, 5 toothed or 5 partite. Petals 5, longer, twisted, and imbricate in æstivation. Male (fig. 3), stamens 10, alternate ones opposite the petals, and a little shorter; filaments each inserted (4) into a hairy scale, having a round or short gynophore (bearing rudiments of ovaries) sometimes wanting. Female flower (fig. 1) with ten scale-like rudiments of stamens; ovaries 5 on a short disk or gynophore, 1-celled, with a single ovule suspended to the inner angle. Styles 5, distinct at the base, united above, and separating again into 5 stigmata. Drupes (fig. 2) 5, or fewer by abortion, dark-coloured, spreading, 1-celled, 1-seeded. Seeds with a membranous shell. Embryo straight; radicle above, retracted within cotyledons.—Aubl. Guian. 2, t. 311 and 312. Nees von Esenbeck, Ic. 382, v. fig. 54.

The *bark of the root* is sent to Europe from Jamaica. It is stripped off in pieces several feet in length, which are folded upon themselves, either flat or partially quilled, a few lines in thickness, light, tough, fibrous in structure, difficult to powder, of a pale colour, greyish throughout, with the epidermis a little warty, without odour, bitter in taste. Water and Alcohol both readily take up its virtues, which depend upon the presence of a principle nearly the same with *Quassine*, Volatile oil, Resin, Ulmine, and several salts.

Fig. 54.

Action. Uses.—Bitter Tonic. Useful in advanced stages of Dysentery and Diarrhœa. It is not officinal in the B. P.

Cedrone Seeds.—The seeds of the *Simaba cedron*, a plant of this order, and a native of New Granada, have obtained a high reputation throughout Central America as a specific against the bites of poisonous serpents. They are extremely bitter in taste, and possess tonic powers, but their peculiar virtues are unauthenticated by credible witnesses, and there is, in fact, no reason for supposing that they would be more efficacious than Serpentary, Senega, Guaco, and other falsely reported antidotes against venomous bites. (P. J. x. 344.)

Sub-class II. Calycifloræ.

Rhamneæ, *R. Brown.* Rhamnads.

The Rhamneæ are found both in the temperate and tropical parts of the world. They vary in properties: some secrete a bitter principle, with which acridity is sometimes united; hence these act as stimulants to some of the functions. Some are useful for the colour (sap-green) yielded when acted on by Lime and alkalies. The fruits of a few are edible, as the Jujube, the Lotus, and the Ber of India.

Rhamni Succus, B. The Juice of the Fruit. Rhamnus catharticus, *Linn.* Common or Purging Buckthorn. *Pentand. Monog.* Linn.

Buckthorn is indigenous in hedges and woods, and found in Europe generally, flowering in May and June, and ripening its fruit in the autumn. It has long been employed in medicine, and thought to be the ῥαμνος of Dioscorides, but without proof.

Bot. Ch.—A spreading shrub 8 to 10 feet high. Old branches forming thorny terminal spines. Leaves sub-opposite, ovate, cordate at base, acute, toothed, with 4 to 6 marked veins parallel to and converging to midrib. Stipules linear. Flowers polygamous, often diœcious, in clusters between the leaves, small, of a yellowish-green colour. Calyx 4-cleft, tubular at base, persistent and adherent to fruit. Petals 4, a little yellowish, male flowers with a stamen opposite to each, and a rudimentary pistil. Female flower—ovary globular with 4 single-seeded cells, and a 4-cleft stigma. Fruit, a small round berry, which becomes black when ripe, containing usually 4 smooth, hard seeds, which are ovate, triangular, and keeled.

Buckthorn Berries are small, round, of a black colour and shining when fully ripe; they contain a greenish pulp, which has a bitter and disagreeable taste and nauseous smell. This is composed of a green Colouring matter, of Acetic acid, Mucilage, Sugar, Azotised matter. (*Vogel.*) According to Hubert, the purgative properties are dependent on the presence of *Cathartine;* but his experiments are not considered conclusive by Soubeiran. A similar property is possessed by the inner bark.

Action. Uses.—Hydragogue Cathartic; but apt to create nausea and griping. Restored from L. P., in B. P. 1867.

Syrupus Rhamni, B. Syrup of Buckthorn.

Prep.—Take of *Buckthorn Juice*, Oiv.; *Ginger*, spiced, *Pimento*, bruised, of each ℥¾; *Refined Sugar*, ℔v. or a sufficiency; *Rectified Spirit*, f℥vi. Evaporate the juice to Oijß, add the ginger and pimento, digest at a gentle heat for four hours, and strain. When cold add the spirit, let the mixture stand for two days, then decant off the clear liquor, and in this dissolve the sugar with a gentle heat, so as to make the specific gravity 1·32.

Dose.—Generally employed instead of the berries or expressed juice, in doses of ʒj.–ʒij.

Terebinthaceæ, *Jussieu.*

The Terebinthaceæ of Jussieu have been divided by modern botanists into several orders, such as *Anacardieæ*, *Burseraceæ*, *Amyrideæ*, and *Conaraceæ*. But these are all so closely allied to one another, participate in so many of the same properties, and have so much the same geographical distribution, that it is convenient to speak of the whole as forming one family under the name of Terebinthaceæ. As it contains, however, only one of the Turpentine-yielding plants, the rest belonging to Coniferæ, the name is objectionable.

The products of the *Terebinthaceæ* have been stated by M. Fée to consist—1. Of fixed Oil in the almond of the seed. 2. Essential Oil, which is combined with Resin in the Turpentine of the Pistacia. 3. Resin, which flows naturally, or from incisions made into the trunks, &c., of most of the species, usually combined with a little Volatile Oil. 4. Gum, seldom found pure, but frequently combined with the Resin, as in Myrrh, &c.

Sub-ord. I. ANACARDIEÆ. *R. Brown.* Anacards.

The tribe is distinguished by a single fertile ovary, 1-celled and 1-seeded. They are the *Terebinthaceæ proper*.

Anacardieæ abound within the tropics, with a few species (as of Rhus in Europe and N. America) extending to higher latitudes. Anacardieæ abound in resinous juice, with volatile oil, or acrid principle, which is employed in varnishing and lacquering. As medicines these juices act as stimulants, or are sufficiently acrid to be poisonous. The seeds of many abound in oil. The bark of some is astringent. The fruit of a few is edible.

PISTACIA, *Linn.* *Diœcia Pentand.* Linn.

Flowers, diœcious, without petals. *Males* in amentaceous racemes, each supported by a scale-like bract. Calyx small, 5-cleft. Stamens 5, opposite to the calycine divisions, nearly sessile, 4-cornered. *Female flowers* in more lax racemes. Calyx 3-4 cleft. Ovary 1, rarely 3-celled. Stigmas 3, thickish, spreading, recurved. Drupe dry, ovate, with a bony commonly 1-seeded nut, sometimes showing laterally 2 abortive cells. Seeds solitary, erect, without albumen. Cotyledons fleshy, containing oil, with a superior lateral radicle. Trees with pinnated leaves. Extending from the Mediterranean region to Affghanistan. In properties resembling the Burseraceæ.

PISTACIA VERA.—The Pistachio Nut tree extends from Syria to Bokhara and Caubul. It has long been introduced into the south of Europe, and is remarkable for its green-coloured kernels enclosed within a reddish-coloured testa, and where the funicle can be well seen. The kernels are oily, and an oil used to be obtained from them. They are pleasant tasted, often eaten at dessert, either raw, or after having been fried with pepper and salt. They have also been made into a demulcent emulsion.

[PISTACIA TEREBINTHUS, *Linn.* L. TEREBINTHINA CHIA; Oleo-resina ex inciso trunco fusa. Liquid Resinous Exudation of the Chian or Pistacia Turpentine Tree.

The Terebinth or species of Pistacia yielding the Turpentine of Chio, was well known to the ancients. It is the *Alah* of the Old Testament, translated *Oak*, *Terebinth*, &c., τερμινθος of the Greeks, and the *butm* of the Arabs. It is found in the south of Europe, Asia Minor, Syria, and the north of Africa.

A tree 20 to 40 feet in height. Leaves pinnate, with an odd one. Leaflets about 7 or 9, ovate, lanceolate, round at the base, acute, mucronate, reddish-coloured when young, afterwards of a dark-green colour. Infloresence a large compound panicle. Scales of the male flower covered with brown hairs. Anthers yellowish. Stigmas of a crimson colour. Fruit, purple, roundish, about the size of a large pea. Horn-shaped galls are produced on these trees.

The Turpentine of this tree is obtained in the island of Chio by making transverse incisions into the bark of the trees, of which each yields only a few ounces, and the whole island not more than 1000 pounds. The harvest is from July to October. The juice issuing from the wounds is allowed to fall upon smooth stones, from which it is scraped, and purified by being melted in the sun and strained into bottles. It used to be taken chiefly to Venice, where it was in request for making the far-famed Theriaca. Chian Turpentine is a pellucid liquid of a yellowish colour, having the consistence of honey, tenacious, with an agreeable terebinthinate smell, and moderately warm taste. Exposed to the air it thickens, and becomes hard from the loss of its Volatile Oil. A Resin is said by Belon to be produced by the same tree, and the small kernels of its fruit are edible. From its scarcity and high price, it is usually adulterated with other Turpentines, which it resembles in properties.

Action. Uses.—Excitant and Diuretic, like the other Turpentines. (*q. v.*, Coniferæ.)]

MASTICHE, B. Pistacia Lentiscus, *Linn.* Resinous Exudation obtained by incision from the stem. Produced in the island of Scio. Mastic.

Mastic and the tree yielding it (Σχινος of the Greeks) were well known to the ancients, from the latter being a native of the Grecian Archipelago and of the Mediterranean region.

The Mastic shrub, about 10 or 12 feet high, is distinguished from the Terebinth tree by having its leaves pinnate without an odd one. Leaflets 8 to 10 in number, usually opposite, small, oval, lanceolate, petiole winged. Both male and female flowers small, in axillary racemes near the ends of the branches. Fruit small, roundish, of a brownish-red colour when ripe.

This shrub is cultivated in the Isle of Scio, whence the Mastic is chiefly obtained by transverse incisions being made in the trunk and principal branches in the month of July. Some of it adheres to the tree in the form of tears, and some falls on the earth, and is collected in August. The best kind is in small roundish or oblong tears, of a pale-yellow colour, transparent, dry, and brittle; hence usually covered with a light white powder from attrition; becoming soft and ductile when chewed; breaks with a vitreous fracture, and has a mild resinous taste and an agreeable odour, especially when rubbed or heated. An inferior kind, in masses of agglutinated tears, is darker coloured, and mixed with impurities.

Mastic melts when heated, and burns at a higher temperature, diffusing an agreeable odour. It is insoluble in water, but completely soluble in Ether. About nine-tenths (a resinous acid which has been called the *Masticic*') are soluble in cold Alcohol, and the remainder, which is soluble only in hot Alcohol, has been called *Masticine.* To this Mastic owes its ductility when in a moist state. Besides these there is a trace of volatile oil.

Action. Uses.—Little used, except as a masticatory in the East, sometimes in fumigation; most frequently by dentists for stuffing decayed teeth. It forms one ingredient of *Tinct. Ammoniæ Comp.*,

L. P.; a substitute for *Eau de Luce.* Commonly used as a varnish, dissolved in Alcohol or Oil of Turpentine.

Rhus Toxicodendron, *Linn.* Poison Oak. *Pentand. Trigyn.* Linn.

The species of Rhus are known for their astringent and resinous, and some for their poisonous properties. The present species was brought into notice in this country by Dr Alderson of Hull, in 1793, by following up the experiments of Du Fresnoi, made at Valenciennes in 1788.

Botanists differ as to whether this is distinct from another plant which has been called *Rhus radicans*, Poison Vine, Poison Ivy, or whether both are only varieties of one species. *Rhus Toxicodendron* forms a shrub of a few feet in height, and has its leaflets irregularly indented or deeply sinuate, hence it is called *Poison Oak*. The leaflets are entire or rarely toothed. The leaves are long-stalked, trifoliate, with the lateral leaflets sessile, the terminal one stalked; they are broad, ovate, or rhombodial acute; leaflets smooth, sometimes a little pubescent, entire or irregularly toothed or lobed. The flowers are small, greenish white, diœcious, produced in lateral, usually axillary panicles. The *male* flowers have a small 5-partite calyx, with erect segments. Petals 5, oblong, recurved. Stamens 5, with the rudiment of a style. The *female* flowers are smaller, have 5 abortive stamens, and a globose 1-celled ovary, with a short erect style terminating in 3 stigmas. The drupes are roundish, of a pale-green colour, juiceless, 1-celled, containing from abortion a bony one-seeded nut.—Bigelow's *Med. Bot.* 111, t. 42.

This plant is not now officinal, though it was included in the L. P. of 1836. It is irritant, and has an action on the muscular system, which resembles that of Strychnia. The leaves, which alone were used, contain a peculiar acrid principle, to which, probably, their medicinal properties are owing.

Action. Uses.—Acrid, Stimulant. Useful in some cases of Paralysis, twitches and pricking of the affected limb being experienced.

Dose.—Gr. j.–gr. v. till pricking commences. A tincture or an Extract of the fresh leaves is preferable. (*c.*)

Sub-ord. II. Burseraceæ. *Kunth.* Balsamads.

The Burseraceæ are distinguished among Terebinthaceæ by their many-celled germen, and by their ovules being pendulous and in pairs; also by their plaited convolute cotyledons. They are all found in tropical parts of the world. The juice of these plants is famed for its balsamic odour and stimulant properties: *e.g.* Balsam of Gilead, Olibanum or Frankincense, Myrrh, Bdellium, Elemi, &c.

Olibanum. Gummi-Resina. Boswellia thurifera, *Colebr.*

This gum-resin was included in late editions of the L. and D. P., but is not now officinal.

The name Olibanum seems to be derived from the Greek λιβανος, and this probably from the Hebrew *lebona.* This is very similar to the Arabic *luban*, which signifies *milk*, or the juice exuding from a tree, and is applied especially to what used in early times to be called Thus, and more recently, Olibanum. Two kinds of Olibanum are known in commerce, one Indian, the other African.

The Indian is imported in chests chiefly from Bombay, also from

Calcutta, but the place producing it is not well ascertained. Mr Turnbull, of the Medical Service, many years since sent some resin of the *Salai* tree collected in the hills near Mirzapore, which in the London market was recognised as Olibanum. Mr Colebrooke determined that *luban* or Olibanum is produced by a tree called *salai.* Dr Royle has also collected a very fragrant resin from the *saleh* tree of North-west India, which bears a very close resemblance to common Olibanum. This tree is *Boswellia glabra*, Roxb., the former is *B. thurifera* of Colebrooke, called *B. serrata* in many works; but as Messrs Wight and Arnott say, "we dare not quote here *B. serrata* Stack, extr. Bruc. p. 19, t. 3, the leaves being usually described as ovate, oblong, and acuminate." Both species were collected by Col. Sykes in the Deccan as the Olibanum tree. Dr O'Shaughnessy states that he has received fine specimens of Olibanum from the Shahabad district, where it is called *salegond*, and at Chandalgur *gunda barosa.*

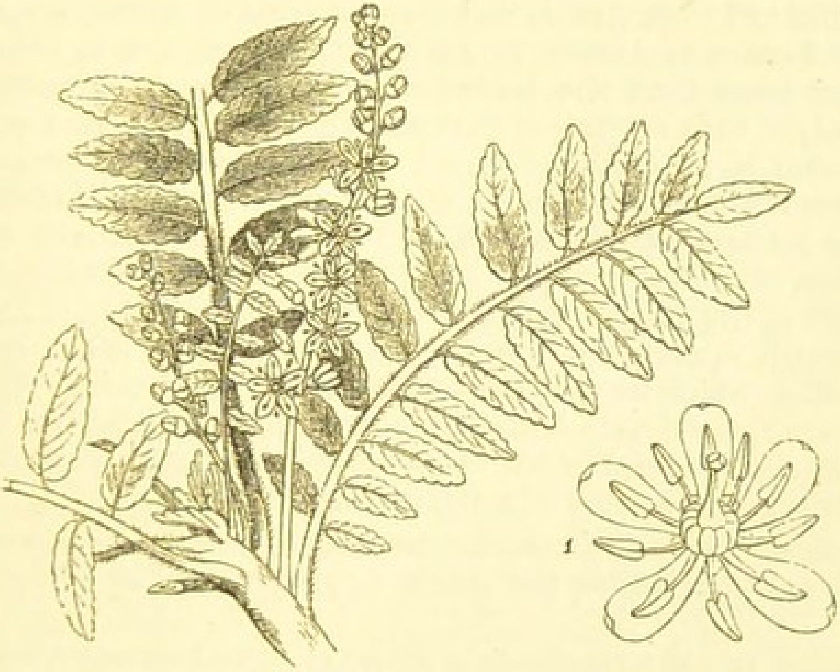

Fig. 55

This tree (*Boswellia thurifera*, fig. 55) grows to a large size in hilly situations, from the Coromandel coast to the central parts of India. It is much-branched, but bare of leaves in its lower parts, but these are crowded and alternate towards the ends of the branches, unequally pinnate. Leaflets oblong, obtuse, cerrated, pubescent. Stipules none. Inflorescence in single axillary racemes near the ends of the branches, shorter than the leaves. Flowers on short pedicels, of a pinkish white colour. Flowers bisexual (v. 55, 1). Calyx small, 5-toothed. Petals 5, obovate, tapering to the base, inserted under the margin of the disk; æstivation slightly imbricate. Disk surrounding the base of the ovary, cup-shaped, fleshy, crenulated. Stamens 10, inserted under the disk. Ovary sessile, 3-celled, with 2 ovules in each, attached to the axis. Style terminated by a capitate 3-lobed stigma. Fruit capsular, 3-angled, 3-celled, 3-valved, septicidal (splitting at the angles into valves). Seeds solitary in each cell, girded by a membranous wing. Cotyledons intricately folded, multifid.

Indian Olibanum, which is the most esteemed, is in roundish or oblong tears, of a reddish or a light-yellow colour, usually covered with whitish powder, from attrition of the pieces against each other, translucent within, of a warm bitterish taste, and having a balsamic odour, especially when warmed or burnt. Sp. Gr. 1·22. A fine specimen, analysed by Dr O'Shaughnessy, gave of Resin 37 parts, Volatile Oil 28 parts, Gum 4, Gluten, 11, in 100 parts. But the quantity of Volatile Oil is necessarily much less when it has been exposed and become dry, as seen in commerce. Braconnot obtained only 8 per cent. of Oil, of Resin 56, Gum 30, matter like Gum 5·2, loss 0·8 = 100.

African Olibanum imported into Venice and Marseilles from Suez, and obtained from Arabia and the east coast of Africa, is mentioned by Dr Pereira as African or Arabian Olibanum, and as occurring in smaller tears than the Indian variety, yellowish or reddish, and intermixed with crystals of Carbonate of Lime. One kind of African Olibanum is no doubt produced on the hills of the Somauli coast westward from Cape Guardafui, and carried to the Arabian coast chiefly by native boats from Maculla. This tree, partially described by Capt. Kemthorne of the Indian navy, has been identified by Mr Bennett of the British Museum with *Plöslea floribunda* of Endlicher, but which appears to Dr Royle to be nothing but a species of Boswellia, which he would therefore call *B. floribunda.* The specimens are covered with little resinous exudations, as are the leaves of a plant collected in the island of Socotra by Lieut. Wellsted, which also appear to be those of a Boswellia.

Action. Uses.—Stimulant. Sometimes used in chronic affections of mucous membranes, but chiefly in plasters, and as a fumigation.

MYRRHA, B. Balsamodendron Myrrha, *Ehrenberg* and *Nees.* Gum-Resinous Exudation from the stem. Myrrh. *Octand. Monog.* Linn. "Collected in Arabia Felix and Abyssinia," B.

Myrrh is first mentioned in Exod. xxx. 23, by the name of *Mor* or *Mur.* The Arabic name also is *Mur.* The Greeks call it μυῤῥα, and also Σμύρνα. Herodotus mentions it as produced in the south with Frankincense, &c. Dioscorides states the variety called *Troglodytica* to be the best. In the Periplus of the Red Sea, Arrian mentions Myrrh with Olibanum as exported from the coast of Barbaria—that is, the modern Berbera. Bruce learnt that it was produced, as well as Frankincense, in the country behind Azab, or in that of the Dankali. The embassy to Abyssinia under Major Harris met with it on the hills in the comparatively flat country which extends from Abyssinia to the Red Sea near the Straits of Bab-el-Mandeb, or from the Doomi Valley to the banks of the Hawash. Mr Johnston (Trav. i. p. 249) met with it in nearly the same locality. Both authors describe the Myrrh as exuding from wounds made in the bark, and state that it is collected in January and March (H.), but chiefly in July and August, and in small quantities at other times of the year (J.), and exchanged for Tobacco with the merchants who proceed to Berbera, &c., whence it is exported to the coast of Arabia.

Dr Malcolmson wrote to Dr Royle from Aden, that it was exported in native boats from different ports in the Red Sea, but chiefly from Berbera, Zeyla, and Massowah, and adds "there is no Myrrh produced in Arabia."

Myrrh, it is well known, now reaches Europe chiefly from Bombay, having been imported from the Arabian and Persian Gulfs. It used formerly to be obtained also from Turkey. Some Myrrh, however, appears to be produced in Arabia, as Ehrenberg and Emprich found a small tree in Arabia near Gison, on the borders of Arabia Felix, from off which they collected some very fine Myrrh. There is still considerable uncertainty respecting the plant or plants which yield Myrrh, though it is probable they all belong to the genus Balsamodendron.

BALSAMODENDRON, *Kunth.* Amyris. Protium, *Wight and Arnott.*

Flowers often unisexual. Calyx 4-toothed, persistent. Petals 4, linear, oblong, induplicately valvate in æstivation. Stamens 8, inserted like the petals under the margin of the annular disk or torus, which is cup-shaped, fleshy, deeply crenated. Ovary 2-celled. Style short, obtuse, 4-lobed. Drupe globose or ovate, nut thick and very hard, bony, 2-celled (one of the cells by abortion often obliterated), cells one-seeded. Balsam-producing trees. Leaves with 3 to 5 sessile leaflets, which are without dots.

B. Gileadense, K.—Unarmed. Leaves palmately 3-foliolate, petiolate, smooth; leaflets obovate, oblong, very entire, glabrous; pedicels short, single-flowered, with the calyx broad, shallow, and campanulate. This includes the *Amyris Opobalsamum* of Forskal; but fresh specimens and recent observations are required to distinguish whether this is different from the *Balessan* of Bruce. Other species which are found in the Peninsula of India and are *spinescent*, used to be included under it, but are considered distinct by Dr Arnott, who does not now unite them with *Protium* (as in the Prod. Fl. Ind. Penins.) from which, indeed, they differ much in habit. Yields *Balm of Gilead.*

The *Balessan* of Bruce was found by him at Azab, and said to extend to the Straits of Bab-el-Mandeb. Gerloch found it at Bederhunin, a village between Mecca and Medina. Forskal found his Opobalsamum at Haes in Arabia Felix. At Aden it is called Beshan. Dr Roth, in the Appendix to Harris' Abyssinia (ii. p. 414) mentions *B. Opobalsamum* as occurring in the Adel country and the jungles of the Hawash along with the Myrrh tree. The bark when wounded exudes the fragrant and far-famed Balsam, which has been called Balm of Gilead, but which seems to have been only cultivated in Palestine near the town of Jericho. It is now never obtainable in Europe in a pure state, and therefore seldom if ever employed medicinally, though it is no doubt possessed of stimulant properties.

B. Myrrha (fig. 56). Stem shrubby, arborescent; branches squarrose, spinescent. Leaves ternate; leaflets obovate, obtuse, obtusely denticulate at the apex, the lateral smooth. Fruit acuminate (Nees).

Bark pale ash-grey, approaching white. Wood yellowish-white; both it and the bark have a peculiar odour. Leaves on short stalks. Flowers unknown. Fruit ovate, smooth, brown, somewhat larger than a pea; surmounted at the base by a four-toothed calyx, and supported on a very short stalk.

We have adopted the above description, as translated by Dr Pereira, who has closely followed the account given by Nees von Esenbeck, in the folio work *Beschreib. Officin. Planzen*, where he says that his friend Dr Ehrenberg collected from off this tree "*sehr schöne Myrrhe*," and that the description is taken from the specimens of the plant collected by Ehrenberg at Gison, on the borders of Arabia Felix.

Fig. 56. Balsamodendron Myrrha. 1, 2, 3. B. Kataf.

Though it is not very probable from modern information that any large quantity of Myrrh is produced in Arabia, yet it is possible that some may be produced there, and from the same species of plant as that which yields the large quantities of Myrrh in Africa. Indeed, it is stated in the Appendix to Harris' Abyssinia (ii. 414), probably on the authority of Dr Roth, that the "*Balsamodendron Myrrha* (*Karbeta* of the natives) grows on the borders of Efat and in the jungles of the Hawash, and in the Adel desert. The resinous gum called *Hofali* is collected for exportation. *B. Opobalsamum* (Besham) grows commonly with the former, and grows even at Cape Aden." Unfortunately there were no specimens of either plant in the Herbarium collected by the embassy and sent to the India House.

On examining the specimens in the British Museum of *B. Opobalsamum*, or *B. Gileadense*, now united into one species, it appears that the specimens vary sufficiently to require careful examination and detailed description of good and complete specimens before we can distinguish them as varieties, or determine them to belong to separate species; also, it is not clear whether the above *B. Myrrha* itself differs sufficiently to constitute a distinct species. The drawing of Nees, of which the annexed woodcut (fig. 56) is a copy, seems to resemble some of the Arabian specimens of *B. Opobalsamum* very closely. All are very distinct, both in foliage and inflorescence, from *B. Kataf* (v. 56, 1, 2, 3), of which a specimen collected by Forskal is in the British Museum. The species referred to by Dr Roth are probably the same as the following.

Mr Johnston, also, in his travels through Adel to Abyssinia (i. p. 247), in treating "of the tree that yields this useful drug, Myrrh," says, "there are in the country of Adel two varieties: one a low, thorny, ragged-looking tree, with bright-green leaves, trifoliate, and an undulating edge, is that which has been described by Ehrenberg" (*v.* the annexed figure, 56). "This produces the finest kind of Myrrh in our shops." This may be either the above *B. Myrrha* or one of the forms of *B. Opobalsamum*. "The other is a more leafy tree, if I may use the expression, and its appearance reminded me exceedingly of the common hawthorn of home, having the same largely serrated, dark-green leaves, growing in bunches of four or five, springing by several leaf-stalks from a common centre. The flowers are small, of a light-green colour, hanging in pairs beneath the leaves, and in size and shape resemble very much the flowers of our gooseberry-tree. It belongs to Octandria Monogynia, the eight stamens being alternately long and short, the former corresponding to the four partial clefts in the edge of the one-leafed calyx. The fruit is a kind of berry, that when ripe easily throws off the dry shell in two pieces, and the two seeds it contains escape. The outer bark is thin, transparent, and easily detached; the inner, thick, woody. When wounded, a yellow, turbid fluid (the gum-myrrh) immediately makes its appearance. Naturally, the gum exudes from cracks in the bark of the trunk near the root, and flows freely upon the stones immediately underneath. Artificially, it is obtained by bruises made with stones."

This plant, judging from the specimens deposited by Mr Johnston in the British Museum, corresponds exactly with one, also in the same collection, obtained by Mr Salt in Abyssinia, *Balsamodendron Kua* of Mr Brown's MSS., and of which Mr Salt says, he obtained from it a gum much resembling the Myrrh.

[B. AFRICANUM, *Arnott.* (*Heudelotia Africana*, Guill. et Per.)
B. MUKUL, *Hook;* and B. PUBESCENS, *Stocks.*[*] Trees producing Bdellium.

The first species, found in the west of Africa, occurs also in the Abyssinian collection, having been found in the flat country of the Adel.[†] It yields African Bdellium, or that imported into France from Guinea and the Senegal, according to M. Perrotet. M. Adanson, likewise, in his Travels in the Senegal, mentions it by the name of Niotout, as producing Bdellium. It may also yield the Bdellium which is exported from the west coast of Africa. Dr Malcolmson wrote to Dr Royle that "Bdellium (of which he sent a specimen) is

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[*] See Dr Stocks on Balsam Trees of Scinde.

[†] Mr Johnston immediately recognised it as one of the trees yielding gum-resin. The leaflets are like those of *B. Kua*, Br.

produced in Africa by a tree similar to the Myrtle. None is obtained in Arabia. It is very similar to Myrrh, and sometimes sold for it."

One kind of Bdellium is produced in India, which Dr Royle was informed was yielded by a tree called *googul* by the natives (*v.* Himal. Bot. 177), and which is the *Amyris Commiphora* of Roxb. referred by Messrs Wight and Arnott to Balsamodendron. It is the *Balsamodendron Mukul* of Hook. Dr Walker, in his account of the drugs produced near Aurungabad, states "a gum-resin, called by the natives *googool,* is produced by a tree which grows in the neighbourhood of Umber, a town twenty miles to the westward of Aurungabad. Roxburgh imagined that Googool was identical with Myrrh."]

The whole of the species of this genus require to be carefully examined from good and authentic specimens accompanied by their respective products, before the several doubts can be resolved.

Prop.—Myrrh is imported from Bombay. It is generally in pieces of irregular form and size, formed apparently of agglutinated tears, dry, and covered with a fine dust, commonly of a reddish-brown colour; brittle; fracture irregular, conchoidal, shining; with the surface apparently dotted with volatile oil, often varied with opaque, whitish, semicircular marks; the smaller pieces angular, shining, semi-transparent; taste bitter and aromatic; smell peculiar and balsamic. Other kinds are also met with, probably derived from the same source, as it sometimes reaches this country with the different qualities intermixed (*Myrrh in sorts*) or consisting of finer pieces picked out (*Turkey* or *picked Myrrh*). But when the process is adopted abroad, the inferior qualities may come separately, or remain intermixed with other gums or resins, especially Bdellium, from the careless manner in which all are collected by the natives. The specimens brought by the Abyssinian embassy have *granular* fragments mixed with roundish tears; and some of a pale, even whitish, colour may be seen on the same piece of bark with ordinary coloured Myrrh. The specimens which have not been exposed to the air are darker coloured, moister, and of a more powerful and agreeable smell.

Indian Bdellium is sometimes sold for and considered as an inferior kind of Myrrh. It is in roundish pieces of a dull dark-red colour, more moist than Myrrh, and not brittle like it, softening even with the heat of the hand; bitter, and a little acrid in taste, with a less agreeable odour. It often has portions of the birch-like bark adhering to it.

Myrrh, when heated, first softens, then burns partially, leaving a black spongy ash. Triturated with water, it forms an emulsion: the Alcoholic tincture is rendered opaque on the addition of water. It is a Gum-resin, with Volatile Oil, and salts of several acids combined with Potash and Lime. The Gum, about 63 per cent., consists of two kinds, one-half being *Bassorin,* or insoluble, and the remainder *Arabin* or soluble Gum. This last, being dissolued in water, helps to suspend the Resin and Oil. The Resin, about 28 per cent., is also of two kinds; one soft, odorous, and soluble in Ether; while the other is hard, without odour, soluble in alkalies. The Volatile Oil, about 2·5 per cent., passes over if distilled with water; it is at first without colour, but becomes yellowish; has the odour and taste of Myrrh; is soluble in Alcohol, Ether, and the fixed Oils. Upon it and the Resin the properties of Myrrh depend.

Action. Uses.—Stomachic, Excitant, Stimulant, Expectorant, Antispasmodic, Emmenagogue.

Dose.—Gr. x.–gr. xxx.; but usually combined with tonics or with purgatives.

TINCTURA MYRRHÆ, B. Tincture of Myrrh.

Prep.—B. *Myrrh* in coarse powder ℥ijß, *Rectified Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—As rectified Spirit is the best solvent for the Resin and Volatile Oil of Myrrh, this is an effective preparation in doses of f℥ß–f℥j. But it is usually only employed as an adjunct, or as an external stimulant application to foul and indolent ulcers.

Off. Prep.—Mist. Ferri Comp. (Pil. Ferri Comp. L.) (Pil. Galbani Comp. L.) Pil. Aloes et Myrrhæ. Decoct. Aloes Comp. Pil. Rhei Comp. Pil. Assafœtidæ Comp.

ELEMI, B. Concrete Resinous Exudation. Probably from Canarium commune, *Linn.* B. Chiefly imported from Manilla.

Elemi has long held a place in works on Materia Medica, but great uncertainty has always prevailed respecting both the country and the plant producing it. C. Bauhin mentions it as Elemi and Elemni officinarum. J. Bauhin (1650) describes it as being in cylindrical pieces, of the consistence and colour of yellow wax, with the odour nearly of Fennel, and wrapped up in a leaf which appears to be that of *Canna indica.* Ray (1688) states that many consider it to be the gum of the Ethiopic Olive, and the word Elemi to be derived from Elea. He refers to a passage "ex Andreæ Bacci autoris gravissimi, lib. 5. de Vinis Apulis," who states that in Apulia the Olives grow to a great size, and on account, he thinks., of the great and continued heat, exude a very excellent gum, "quod Chirurgi gummi Elemi appellant." There appears no evidence to connect Elemi with the Ethiopian Olive of Dioscorides, nor does there seem any proof that it was ever obtained from thence. Indeed, J Bauhin, as early as 1650, says of Elemi, "De loco ejus natali nihil adhuc certi accessimus."

From America, however, a resin was early received, which had the characteristics of Elemi. Marcgraaf describes a Brazilian tree, called *Icicariba*, which exudes a very fragrant resin smelling like freshly-bruised Anethum. His editor, De Laet, says that large quantities of this resin are brought from New Spain, and that it is also collected in Brazil. The American Elemi seems for a long time to have been the only kind procurable, except a factitious preparation made with yellow resin, turpentine, and oil of spike, for making which directions are given by Savary and others. M. Guibourt states, as Rutty had done, that both kinds of Elemi come from America, and that that of Brazil, which Geoffrey calls the *false*, is in the present day the most esteemed, on account of its strong but pleasant odour, which is owing to the presence of much volatile oil. If this kind does actually come from Brazil, it is most probably procured from the above Icicariba of Marcgraaf, *Icica Icicariba*, Dec., as Martinus, in his *Syst. Materiœ Med. Brazil*, p. 118, mentions "*Elemi occidentale*, which in stimulant and healing powers excels the other balsamic resins of Brazil," as obtained from this tree. He also enumerates other species of Icica indigenous in the same region, which pour out balsams which when dry are known as different kinds of Elemi and of Anime.

Elemi has been imported, for several years past, from Manilla into the London market. It is in masses of a light-yellowish colour, internally soft, and about the consistence and appearance of thick honey; smelling strong of Fennel, and in this respect resembling that imported from Mexico. Though it is possible that this might be conveyed as an article of commerce from Acapulco to Manilla, yet M. Perrotet obtained, in the Philippine Islands, a produce like Elemi from a Terebinthaceous tree.

Canarium commune (*C. zephyrinum* of Rumph, H. A. ii. t. 47), cultivated on account of its kernels in the Spice Islands, and extending even to Ceylon, yields a resin, which Rumph describes as white and tenacious, of the consistence of suet, becoming by degrees yellow, and when fresh, exhaling a strong odour; that of the wild plant, he describes as "substantia, colore, et odore, adeo similis est Gummi Elemi, ut pro eo haberetur." The B. P. describes Elemi as "chiefly imported from Manilla."

But Elemi has also been imported direct from Mexico, and Dr Royle received specimens from Dr Budd, to whom they were given by Mr R. Cotesworth, who imported Elemi as an article of commerce from Mexico. These specimens were accompanied by specimens of the trunk, branches, leaves, and fruit; but unfortunately, mostly all detached from their points of insertion. The materials were, however, sufficient to determine that they belonged to the genus *Elaphrium*, and that the species was a new one, which Dr Royle named *E. elemiferum*, from its produce. To this probably early accounts refer as the Elemi-like produce of New Spain.

ELAPHRIUM ELEMIFERUM, *Royle.*

Twelve feet high; stem three inches in diameter; wood white, spongy; bark about a line in thickness, rugose, of a reddish-brown colour, but covered with a grey epidermis and lichens; branches tortuous; twigs smooth, somewhat angular, striated, and flexuose; leaves exstipulate, unequally pinnate; rachis winged; leaflets 3 to 10 pairs, opposite, without dots, very variable in form, ovate, obtuse, even roundish, entire or ovate-acuminate, irregularly toothed, the terminal one usually elongated acute, the lateral ones, especially the lower pairs, are sometimes ternately or pinnately cut, with their petioles also winged; at other times all the leaflets are rhomboidal and deeply cut into acute segments; all are smooth and shining on the upper surface. Flowers not seen.

Drupes ovoid and rather acute, composed of a thick and tough epicarp, which splits into two valves, and displays the blackish apex of the seed, of which the lower part is enveloped in a reddish-yellow aril-looking body (membrana tenui pulpa molli testi, *Jacq.*) vestita, *Kunth.* in ch, Generis), which exhales a strong odour of Elemi when scraped; seeds single, ovate, one being abortive; cotyledons contortuplicate; radicle above.—Native of Mexico, near Oaxaca.

Dr Pereira has received from Dr Christison the resin of *Canarium balsamiferum* of Ceylon, which in odour and general appearance strongly resembles Elemi. And the resin called *Arbol-a-brea* at Manilla, which somewhat resembles Elemi, is considered by M. Baup to be the product of *Canarium album*, a tree which is common in the Philippines.

If the Molucca resin should be found to be exported, it will account for our having for many years received one kind of Elemi from Holland, as was long since stated to be the case by Pomet, and as has been traced out by Dr Pereira, whence he rightly concluded that it was the produce of a Dutch settlement.

Hence it appears that the different kinds of Elemi are produced—

MANILLA ELEMI, probably by *Canarium commune*, Linn. Rumph, H. A. ii. t. 47. Kœnig. An. Bot. t. 7, f. 2.

BRAZILIAN ELEMI, by *Icica Icicariba.* Marcg. Ic. p. 98, Piso, Ic. p. 59. Martius, Pl. Med. t. 22.

MEXICAN ELEMI, by *Elaphrium elemiferum*, Royle.

Elemi necessarily varies according to the source whence it has been obtained; but it has generally something of a waxy appearance, is of a light-yellow tint, changing to a deeper colour, with occasionally a tinge of green; soft or hard, dry or moist, according to the time it has been exposed, and the degree in which the volatile oil has become evaporated. The odour of the different kinds varies in fragrance, being more or less agreeable, but in some smelling strongly of fennel, especially when the resin is freshly imported and moist; in others, this odour is mixed with that of lemons. Elemi is "almost entirely soluble in rectified Spirit." (B.) Factitious Elemi is of a dark-yellow colour, something like yellow resin, but with more of a terebinthinate odour. The Elemi analysed by Bonastre yielded 60 parts of Resin, 24 of a peculiar crystalline body, *Elemine*, insoluble in cold Alcohol, 12·5 of volatile Oil, 2 of Bitter Extractive, and 1·5 of impurities. But the volatile Oil must be in much larger proportion in recent specimens.

Action. Uses.—Stimulant. Formerly an ingredient of the ointment of Arcæus.

UNG. ELEMI, B. Elemi Ointment.

Prep.—B. *Elemi*, ℥¼; *Simple Ointment*, ℥j. Melt, strain through flannel, and stir constantly till it solidifies.

LEGUMINOSÆ, *Juss.* Leguminous Plants.

The *Leguminosæ* are so named from the fruit of all consisting of a legume or pod, and form one of the largest of the natural families of plants. They may be divided into several very natural groups, but are usually treated of under the head of three sub-orders named Mimoseæ, Cæsalpineæ, and Papilionaceæ.

Sub-ord. I. MIMOSEÆ, *R. Brown.* Mimosads.

In this division the flowers are regular, usually spiked, or capitate. Sepals and petals 4-5, valvate. Stamens numerous, free or monadelphous.

The Mimoseæ are found in tropical parts of the world, with comparatively few species in the north, but great numbers in the south temperate zone. They are characteristic of hot dry parts of the world. Many of the species exude gum and secrete astringent principles in their bark, wood, and fruit.

ACACIA, *Dec.* *Polygamia Monœcia*, Linn.

Flowers polygamous. Calyx 4 to 5-toothed. Petals 4–5, either free or united together, and forming a 4–5 cleft corolla. Stamens varying in number from 8–200, distinct or united into bundles. Legume continuous, dry, bivalved. Seeds without pulp. Shrubs or trees, unarmed, or provided with stipular thorns or scattered prickles. Flowers yellow, white, or occasionally red, in globular heads or elongated spikes. Several of the species exude gum, and store up astringent matter in the wood, bark, and legumes.

ACACIÆ GUMMI, B. A gummy exudation from the stem. One or more undetermined species of Acacia. Gum Acacia or Gum Arabic.

Gum, being an exudation from many trees, especially in warm and dry climates, must have been known from the most remote antiquity; and hence we find it mentioned by early Greek writers. It probably formed an article of commerce from Africa into Europe in ancient as it does in modern times. Gum being required for use in the arts as well as in medicine, large quantities are imported from the west and the east coasts of Africa, from Egypt, Arabia, India, New Holland, and from the Cape of Good Hope. The B. P. (1864) described it as "collected chiefly in Kordofan in Eastern Africa, and imported from Alexandria."

1. *Gum Arabic*, so called from being supposed to be produced in Arabia, is imported in immense quantities from Africa into Aden; none is collected and very little produced in Arabia (Malcolmson). It used to be produced in upper Egypt and Nubia. M. Pallme describes the gum as being collected in Kordofan, especially in the district of Bara, in November, December, and January; as being of the finest quality, and erroneously named Gum Arabic; from 10,000 to 14,000 cwt. annually being conveyed on camels from Bara to Dongola on the Nile, whence it is carried to Cairo, and thence distributed to Europe. As the whole of the arid desert country is covered with Acacia trees, much is also conveyed to the ports of the Red Sea, and from thence to the opposite coasts of Arabia, whence it is re-exported to Bombay, and from thence to this country. This

gum is probably yielded chiefly by *A. Seyal*, *A. Ehrenbergii*, and *A. tortilis;* and a very little by *A. vera* and *A. arabica.*

M. Pallme says that the Gum-tree of Kordofan differs materially in the shape of the tree, its leaves, and spines, from the *Mimosa nilotica*, that is, *Acacia vera.*

Mr Johnston, when near the Hawash, had given to him a lump of soft Gum Arabic, nearly a pound in weight, and of most agreeable flavour, like a green ear of corn. He mentions, at the same time, that the trees were without exception the long-thorned Mimosa, and tall enough to ride under. It was probably the *A. tortilis* or *A. Seyal.*

2. *Gum Senegal* is imported from Portendic, Sierra Leone, and the French settlements on the Senegal, being produced chiefly in the desert country to the north of this river.

Acacia Verec is stated by the authors of the Fl. de Senegambie to yield the pale and fine varieties, *A. albida* (*A. Senegal*, Willd.), and *A. Adansonii*, the inferior reddish varieties. *A. Seyal*, *A. vera*, and *A. arabica*, being found in Senegambia, probably also yield some of the gum exported from the western coast.

3. *Barbary Gum* is exported from Mogador, on the west coast of Africa, and is produced in a similar kind of country. It is an inferior product, and, moreover, a mixture of two or three kinds.

Acacia gummifera is thought to yield some of this gum. Jackson gives *attalet* as the name of the tree which produces gum.

4. *East India Gum* is exported to Europe chiefly from Bombay, having been previously conveyed there from the coast of Arabia; so that it is chiefly of African origin. But some of Indian origin is also exported from Calcutta and Bombay by the names of Babool Gum and Gum Gattie, which is that of the *Acacia arabica*, and is of good quality; and Gum is yielded also by *Acacia Serissa*, and *A.* (now *Vachelia*) *farnesiana*, as well as by species of other genera.

5. Gum is also imported from the Cape of Good Hope, yielded by *Acacia Karroo*, according to some. Dr Pappe (Floræ Cap. Med. Prodomus) states that the Cape gum is derived from the *A. horrida*, called *Doorn boom* by the settlers; also that a superior gum is obtained from the *A. Giraffæ*, or *Kameel doorn*, a tree which grows beyond the limits of the colony.

6. *A. decurrens* yields gum in New Holland.

As space cannot be afforded for all, we will restrict ourselves to one of the best known of the officinal species.

Acacia vera, Willd. (*Mimosa nilotica*, Linn.)—A middling-sized tree, with spines in pairs, straight, sharp, about a quarter to half an inch long. Leaves bipinnate, and, as well as the branches, smooth: these are covered with a reddish-brown bark. Two pairs of pinnæ, leaflets small, 8 to 10 pairs, oblong linear, with a gland between the pinnæ. Flowers in yellow globose heads, from 2 to 5 in the axillæ of the leaves, and stalked. The legume is moniliform, short, straight, and containing but few seeds. A native of Egypt, and extending across Africa to the Senegal. An astringent extract, known to the ancients by the name of *ακακια*, was prepared from the legumes of this and probably of other species. Dr Royle obtained it in the bazaars of India by the old name of *akakia.*

Gum, dissolved in water, or in the form of a mucilage, is a very generally diffused principle of vegetables. It flows from the several Acacias in a liquid state, but soon hardens, and may be seen from a perfectly colourless substance to different shades of yellow, even on the same tree. It is in dry, semi-transparent, roundish masses, of the size of a small nut, or larger, often in fragments, rugose at the surface, brittle, friable; fracture vitreous; without odour; of a mild, slightly sweetish, viscous taste. Sp. Gr. about 1·31 to 1·52. It is soluble in water, having a slightly acid reaction on Litmus. The finer pieces are often separated after being imported, and form the picked or Turkey Gum; the inferior kinds are in larger or irregular pieces, of a deeper colour, more mixed with impurities, and less soluble. Subjected to heat, it loses 17·6 per cent. of water. It yields 3 per cent. of ashes, composed chiefly of Carbonate of Potash and Carbonate of Lime, with a minute portion of Oxide of Iron, and contains 79·6 of soluble Gum or *Arabine*, which displays the characteristics of pure Gum, and is composed of $C_{12} H_{11} O_{11}$ or $C_{24} H_{22} O_{22}$ (*Liebig*), and is therefore identical in composition with Cane Sugar. It is insoluble in Alcohol, which, indeed, precipitates it from its watery solution. Perchloride of Iron forms with it a brown jelly. Diacetate of Lead and Silicate of Potash also cause a white precipitate in this solution. "The solution forms with Subacetate of Lead an opaque white jelly." (B.) Boiled with Sul′, a variety of Sugar is produced; but if with Nit′, Mucic and Oxalic acids. From recent researches it appears that Arabine is of an acid nature, and forms with the alkalies, lime, baryta, and lead, compounds which may be considered as salts. The compound of Arabine with lime is adhesive in nature, and is said to exist in Gum Senegal and other kinds (Neubaur).

Adulterations.—The inferior kinds of Gum are apt to be intermixed with the finer kinds of African Gum, especially when powdered: when in this state, starch also is apt to be added, but may be detected with Iodine. "The powder does not become blue on the addition of an aqueous solution of Iodine." (B.)

M. Picciotto proposes to purify coloured and impure sorts by dissolving them in a strong solution of sulphurous acid, by which means the colour is discharged. The acid being removed by the addition of Carbonate of Baryta, with which it forms an insoluble Sulphite, the decolorised gum is obtained by filtration and evaporation of the solution. (P. J. ix. 16.)

Action. Uses.—Demulcent. Used in its solid form, or in powder, or in the form of Mucilage. Contained in Mist. Cretæ, Mist. Guaiaci Pulv. Amygdalæ Comp., Pulv. Tragacanthæ Comp., and in all the lozenges of the B. P.

MUCILAGO ACACIÆ, B. Mucilage of Acacia.

Prep.—B. Take of *Gum Acacia*, in small pieces, ℥iv.; *Distilled water*, f℥vj. Put the gum and water into a covered earthern jar, and stir them frequently until the gum is dissolved. If necessary, strain the solution through muslin.

Action. Uses.—Demulcent. May be taken *ad libitum*. Employed pharmaceutically to suspend powders, or to make a mixture with oily and resinous substances. In this process heat is injurious.

CATECHU NIGRUM, L., and B. 1864. Acacia Catechu, *Willd.* Extract of the Heart-Wood. Black Catechu.

The early history of Catechu is obscure: it must have been known in India from very early times, as it is one of the ingredients of the compounds which they chew with the leaf of the Betel Pepper. But the Persian works on Materia Medica in use in India do not quote any Arabic or Greek names for it. It was known to Garcias ab Horto, who supposed it to have been the Lycium of Dioscorides. But this Dr Boyle found to have been the extract of Barberry-root.*

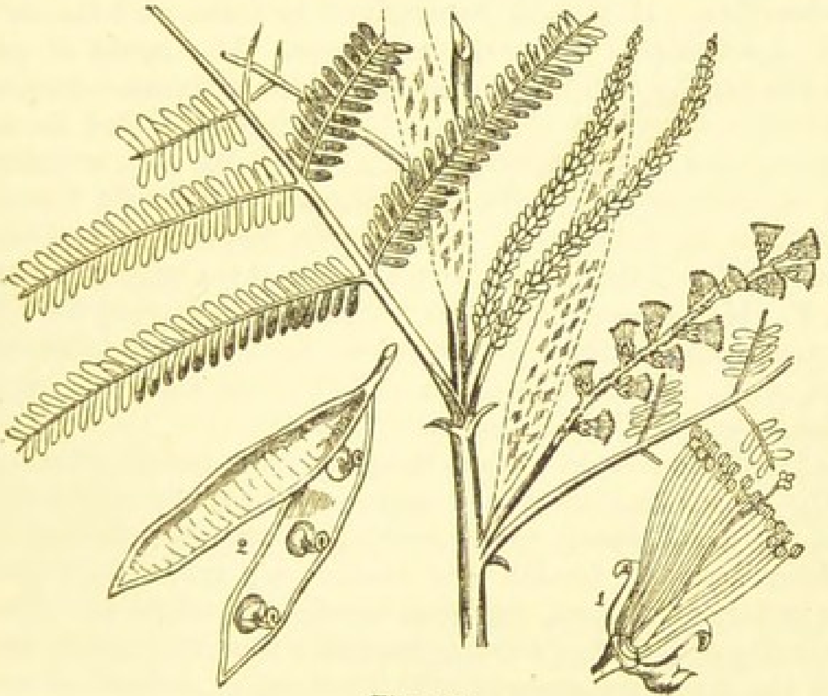

Fig. 57.

A great variety of such astringent extracts are now known, which are prepared from the wood, bark, leaves, and fruit of various plants. Besides the product of the *Acacia Catechu*, there is that prepared from the Betel-nut, or seed of the *Areca Catechu;* and the "Pale Catechu," or *Uncaria Gambir*, from the leaves of which is extracted the kind called in commerce Terra Japonica or Gambir, which is in square pieces. (*See* Cinchonaceæ.) This Pale Catechu is now alone recognised in the B. P. 1867. Black Catechu, however, is preferred in the arts on account of its superior astringency. The Acacias are most noted for the secretion of astringent principle in the wood, bark, and legumes of various species, which hence form articles of commerce, and are employed in tanning. And none are more valuable in this respect than the species yielding Black Catechu.

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* See a Paper on the Lycium of Dioscorides, by Dr Royle. Linnean Trans. vol. xvii. p. 83.

Acacia Catechu, *Willd.*—A tree from 15 to 20, but sometimes 30 feet high, with hard and heavy wood, of which the interior is of a dark red or brownish colour, and the sap-wood white. Branches with stipulary thorns. Leaves bipinnate. Pinnæ 10 to 15 pairs. Leaflets 30 to 50 pairs; linear oblong, unequal and auricled on the lower side at the base; petiole angular, often armed in arid situations with a row of prickles on the under side, with one large urceolate gland below the lowest pair of pinnæ, and smaller ones between the 2 to 4 terminal ones. Inflorescence a spike, 1 to 3 together in the axillæ of the leaves. Flowers numerous, white. Calyx downy, 5-fid. Petals united into a 5-fid corolla. Stamens numerous, distinct, double the length of the corolla. Ovary shortly stipulate, Style the length of the stamens. Legumes straight, thin and flat and smooth, with about 4-6 seeds. A native of the jungles and low hills of many parts of India.—*Roxb.* Corom. Plants, 11, t. 175.

Catechu (called *Kut* and *Kutch* by the natives of the East), is properly an extract prepared from the wood of the above tree; but the term is now applied also to other *extracts* similar in appearance and properties. It should be confined to these, and the term Kino applied to astringent *natural exudations.* The mode of preparing Black Catechu, by cutting into chips the inner brown-coloured wood, and making a decoction which is afterwards evaporated to a proper consistence, was first accurately described by Mr Ker, as practised in Behar; so it is on the confines of Nepal. Dr Royle has seen the same process in North-west India. We have evidence that it is so prepared on the Malabar coast, and also in Ava, from the same tree. The B. P. (1864) described Black Catechu as imported from Pegu.

An astringent extract is prepared from the kernels of *Areca Catechu*, q. v., and the Catechu called *Pale Catechu*, or *Gambir*, from the leaves of *Uncaria Gambir*, q. v.

Catechu of the Acacia is seen in square or roundish pieces or balls, generally of a blackish-brown colour externally; either earthy in texture, or lamellated, or presenting a smooth shining fracture. Some kinds are more friable than others; all are without smell; the taste is bitter, astringent, followed by a little sweetness. The pieces are generally of a darker colour externally than they are in the inside. Some of the kinds are covered with Rice husks; others are enveloped in leaves, which Dr Pereira has ascertained to be those of *Nauclea Brunonis*, a native of the Malayan peninsula.

There is a *pale* variety of Catechu of the Acacia; we have obtained both kinds in the bazaars at Calcutta, the pale being imported from the upper provinces, and the dark from Pegu. Dark-brown Catechus are also obtained from Bombay. Both kinds may no doubt be prepared from the same tree, as a greater degree of heat, or longer-continued heat, and greater exposure to light, is said to produce the dark colour. The dark are heavier, more dense in texture, and have a resinous fracture. Pale Catechu is referred by the B. P. to *Uncaria Gambir*, and said to be prepared in Singapore and the Eastern Archipelago.

The largest portion of good Catechu is taken up by water, especially when boiling, the infusion being of a light or reddish-brown colour, according to its strength; it reddens Litmus, and is strongly astringent in taste. It yields a precipitate with the salts of Alumina, also with Acetate of Lead, and one of a blackish-green colour with the salts of the Peroxide of Iron. From forming a curdy precipitate with a solution of Gelatine, Catechu is applicable to the tanning of leather, for which it is now much employed.

Sir H. Davy, in analysing the Dark and Pale Catechu, or the Bombay and Bengal, as they were called, obtained from

	Of Tannin.	Extractive.	Mucilage.	Insol. residuum.
Dark Catechu,	109	68	13	10 = 200
Pale ,,	97	73	16	14 = 200

The Tannin of Catechu is very similar in properties to that obtained from Galls. The principle, called Extractive by Sir H. Davy, has been since named *Catechine*, or *Catechuic acid.* This is most easily obtained by treating Gambir with cold water; the Tannin being dissolved, the insoluble residue is impure Catechine, which may be purified by solution in Alcohol and subsequent crystallisation, when it looks like a white powder, but is in silky needles, and has something of a sweetish taste, producing a green colour with the salts of Iron. It is composed of $C_{15}\ H_6\ O_6$.

M. Soubeiran has engaged in a series of researches on the subject of Catechu. He infers from his experiments that Pegu (Black) Catechu is the most astringent of all the vegetable astringents; next in order comes Jamaica Kino; next, Amboyna Kino; fourth on the list being Indian (pale) Catechu; and fifth, Extract of Rhatany. 8 parts of Pegu Catechu are determined to contain as much Tannin as 10, 12, 14, and 15 parts of the others, respectively. Solutions of the astringent vegetables were further distinguished by their varying reactions with a solution of Perchloride of Iron. This imparted to the infusion of Pegu Catechu a green colour; of Ind. Catechu, or Kino, brown; of Rhatany, dull grey; or with Tormentil, Oak bark, or Bistort, blue.

Tests.—Catechu occurs of very different qualities, and is liable to be mixed with mechanical impurities. Pale Catechu is entirely soluble in boiling water, and this liquid, when cooled, does not become blue on the addition of Iodine. (Test for Starch.) The Black or Heavy Catechu is less readily soluble. If Ether be digested on 100 gr. of either kind of Catechu, so much ought to be dissolved, that 40 gr. of the dried ethereal extract will be soluble in cold water. (This is a measure of the amount of Tannin.) The finest qualities yield to Sulphuric Ether 53, and the lowest qualities 28 per cent. of Tannin dried at 280°.

Action. Uses.—Powerful Astringent. Applied externally, or taken internally.

Dose.—Gr. x.–gr. xxx. or more of the powder.

Although more powerful than the Pale kind, Black Catechu is, for some unknown cause, omitted in the B. P. 1867.

The bark of *Erythrophlœum judiciale*, the Sassy bark tree of Sierra Leone, possesses narcotic and irritant properties, and is used in trial by ordeal among the natives of the Gold Coast. This tree belongs to the sub-order Mimoseæ.

Sub-ord. II. Cæsalpineæ, or Cæsalpiniads, *Brown.*

In this tribe the corolla is nearly regular, or sub-papilionaceous, of 5 free imbricate petals. Stamens 10, or fewer, usually free.

The Cæsalpineæ abound in tropical and warm parts of the world; a few, as *Cercis Siliquastrum*, spread into more northern latitudes. Some are highly ornamental. The wood of many is red-coloured and astringent. *Hymenæa Courbaril* yields a resin, the *Gum Anime* of the shops. The leaves and fruit of some are purgative, as of the Cassia Sennas and of the Tamarind.

Hæmatoxyli Lignum, B. Hæmatoxylon campechianum, *Linn.* The Heartwood, sliced. Logwood. *Decandria Monogynia*, Linn.

Logwood is noticed by Monardes for its medical uses; but it has also been long employed in the art of dyeing. It is a native of the coast of Campeachy, but is now common in the West Indies, as also in India. It is imported from Campeachy, Honduras, and Jamaica.

A tree (fig. 58) of moderate size, stem generally crooked, furnished with spines in arid, but uanarmed in moist situations. Leaves 2–4 from the same point, pinnate; leaflets 2 to 4 paired, obovate or obcordate. Flowers in racemes, shortly stalked, yellow. Sepals 5, united at the base into a permanent cup, the laminæ being purplish and deciduous. Petals 5, obovate, a little larger than the sepals. Stamens 10, hairy at the base. Legume (2) small, compressed, lanceolate, pointed at each end, 2-seeded, sutures indehiscent, valves bursting longitudinally in the middle.—*Sloane*, Hist. 2, t. x. f. 1 to 4.

Fig. 58.

The sap-wood of this tree, being light-coloured, is rejected, but the interior red-coloured wood is imported in logs, chiefly for the use of the dyer. These are externally of a dark colour, internally yellowish-red. The wood is hard, close-grained, and tough;

usually in chips. Sp. Gr. 1·057. It has a slight but rather pleasant smell when in mass, which is compared to that of Iris-root; the taste is slightly bitter and astringent, with a little sweetness. Both water and Alcohol take up its active principles; acids render its decoction of a brighter red, and throw down a slight precipitate. Alkalies produce a purplish colour. Alum, Acetate of Lead, and the salts of Iron, throw down precipitates, the last of a bluish-black colour; and Gelatine reddish-coloured flakes. Analysed by Chevreul, it yielded Volatile Oil, an Oleaginous or Resinous matter, a brown substance containing Tannin, Glutinous matter, several salts, and a peculiar azotised, crystalline colouring substance, *Hæmatine*, which is occasionally deposited in the form of crystals in the wood, and may sometimes be obtained by evaporating red ink. It has a sub-astringent and a slightly bitter taste.

Action. Uses.—Mild Astringent and Tonic.

DECOCTUM HÆMATOXYLI, B. Decoction of Logwood.

Prep.—B. Boil *Logwood-chips* ℥j. in *Dist. water* Oj. for ten minutes, adding towards the end *Cinnamon* in powder gr. lx. Strain, and make up with *Dist. water* to Oj.

Action. Uses.—Astringent; given in Diarrhœas in doses of f℥j.–f℥ij.

EXTRACTUM HÆMATOXYLI, B. Extract of Logwood.

Prep.—B. Macerate *Logwood* in fine chips ℔j. in *boiling Aq. dest.* Cj. for twenty-four hours. Then boil down to half; strain the liquor, and evaporate to dryness, stirring with a wooden spatula. Iron vessels not to be used.

Action. Uses.—Astringent in doses of gr. x.–gr. xxx.

TAMARINDUS, B. Tamarindus indica, *Linn.* Common Tamarind Tree. The preserved pulp of the fruit (from the West Indies). *Monadelphia Triandria*, Linn.

The Tamarind is a native of India, and has been long used there as an article of diet and in medicine. The Arabs, on becoming acquainted with it, called it *Tamr hindee*—that is, "the Indian Date," whence, no doubt, the Latin name is derived.

A lofty tree with crooked branches, remarkable for its light and elegant foliage. Leaves abruptly pinnate, with 10 to 15 pairs of leaflets which are small, narrow, oblong, obtuse. Stipules small, deciduous. Flowers in lateral and terminal racemes, of a yellow colour variegated with red. Calyx turbinate, at the base, limb bilabiate, reflexed, upper lip tripartite, lower broad 2-toothed. Petals 3, unilateral, the middle cucullate. Stamens 2–3 united together, and fully developed, 7 very short and without anthers. Ovary stalked, style subulate. Legume pendulous, broad and thickish, more or less curved, having externally a hard but brittle scabrous rind, which does not separate into valves, but under it run some woody fibres, and there lies some acidulous reddish-brown pulp. Seeds from 3 to 12, covered by a membranous coat, flattened, bluntly 4-angled, smooth, hard, and brown coloured, inserted into the convex side of the legume. There is no solid foundation for the distinction into two species; *T. orientalis* being supposed to be 6–12 seeded, and *T. occidentalis* 3–4 seeded.

Tamarinds are sometimes imported dried, as from India, where there are two varieties, one a dark and the other a light coloured fruit. In the West Indies, the outer shell having been removed, they are preserved either between layers of moist sugar or in syrup. Preparations are also made from them with sugar in India, which are employed in making sherbets. They are also used in preserving fish, which is hence called Tamarind Fish. The proper officinal part is the pulp stored up between the seeds and husk.

Tamarinds have a powerful acid taste; but when preserved, they are sweet and acidulous, and then form a dark-coloured adhesive mass, containing pulp, stringy fibres, seeds, and sugar. Vauquelin, in one of the first analyses he published, found of Citric′ 9·4, Tartaric′ 1·55, Malic′ 0·45, Bitartrate of Potash 3·25, Sugar 12·5, Gum 4·7, Pectin 6·25, Parenchymatous fibre 34·35, with Water 27·55 = 100.

Copper has been occasionally detected in the Tamarinds imported; hence the B. P. has them tested with a "piece of bright iron, left in contact with the pulp for an hour."

Action. Uses.—Refrigerant, Laxative. A Syrup of Tamarinds diluted with water makes an excellent refrigerant drink. An Infusion may be similarly used; as also Tamarind Whey, made by boiling Tamarind pulp ℥ij. in Milk Oij.

Off. Prep.—Confect. Sennæ. (Confect. Cassiæ, L.)

CASSIA, *Linn.* *Decand. Monog.* Linn.

Calyx of 5 sepals, which are united at the base, and more or less unequal. Petals 5, also unequal. Stamens 10, free, the 3 upper short, rarely fertile; the 7 others bearing anthers, but often unequal. Anthers opening at the apex by 2 pores. Ovary stalked, usually arched. Legume usually compressed, many-seeded. Trees, shrubs, or herbs, of tropical countries. Leaves simply and abruptly pinnated, leaflets opposite. Petioles often glandular. Flowers yellow.

CASSIÆ PULPA, B. Cassia Fistula, *Linn.* Pulp of the Pods. Cassia Pulp. Purging Cassia.

This has been unfortunately named, as it is constantly confounded with the Cassia yielded by the family of Laurels, with which the present product has nothing to do. The plant is a native of India, where it is constantly employed in medicine by the natives, and thus became known to the Arabs. The tree has been introduced into the West Indies, whence Cassia pods are now imported, as well as from India and the north of Africa.*

One of the most showy of trees, having something of the foliage of the Ash, with the inflorescence of the Laburnum. Leaves from 12 to 18 inches long, with from 4 to 8 pairs of opposite, ovate, rather pointed leaflets, smooth on both sides, of a light-green colour, from 2 to 6 inches long and 1 to 3 broad. Stipules minute. Petioles round, without glands. Racemes 1 to 2 feet long, pendulous, without bracts. "The three lower filaments longer than the others, with oblong anthers opening by two lines in the face, the other 7 clavate, with pores at the small end." (Lindley.) Ovary slender, smooth, 1-celled, with

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* According to Dr Landerer, the Cassia Fistula of Egypt grows in the neighbourhood of Aphti, about two days' journey from Alexandria. There is here a small forest of these trees, which are thought to be of great age. He states that the Egyptians prefer the unripe fruit.

numerous seeds, and without any transverse separations. Legumes cylindrical, 1 to 2 feet long, smooth, somewhat obtuse, indehiscent, marked externally with 3 longitudinal bands, one being opposite to the two others, divided into a number of spurious cells by transverse partitions. Seed one in each cell, surrounded by a soft blackish-coloured pulp. On account of this peculiarity of the legume, this plant is sometimes but unnecessarily placed in a separate genus, *Cathartocarpus*.

The pods being officinal on account of the pulp, those are to be chosen which are heavy, and in which the seeds do not rattle. The pulp is of a blackish colour, viscid, with a rather mawkish sweet taste, and a slight sickly odour. It is frequently extracted before the exportation of the Cassia, and often contains the seeds and dissepiments of the fruit.

Soubeiran states that four ounces of pod give one ounce of pulp. This, analysed by Vauquelin, yielded Sugar, Gum, Extractive, Vegetable Jelly, Gluten, Parenchyma, and Water. M. Henry states that the Sugar possesses the nauseous taste peculiar to the pulp, and he has announced the presence of a principle having many of the properties of Tannin.

Action. Uses.—Laxative ; in large doses, Purgative.

Dose.—℥ß–℥ij. as a laxative ; but apt to create flatulence, &c. Usually given in combination, as in Conf. Sennæ, and in—

[CONFECTIO CASSIÆ, L. Confection of Cassia.

Prep.—Dissolve *Manna* ℥ij. in *Syrup of Rose* f℥viij., add *Prepared Cassia* ℥vj. and *Prepared Tamarind* ℥j., evaporate to a proper consistence.

Action. Uses.—Laxative in doses of gr. lx.–℥j. for adults.]

SENNA, B. The leaves. *Senna Alexandrina*, produced by Cassia lanceolata and C. obovata ; *Senna Indica*, Tinnivelly Senna, by C. elongata. Senna-leaves.

Senna has been distinctly known only since the time of the Arabs ; but they refer to the legumes only, though the leaves have long been employed in the East. There is still some uncertainty respecting the species of Cassia which yield the different commercial varieties. This is owing partly to all the Senna countries not having been thoroughly explored, and partly to some species having been formed from imperfect specimens, and others from leaves collected out of different samples of the Sennas of commerce. The following species seem to be clearly distinct. Dr Royle has changed the name of Forskal's *C. lanceolata*, in consequence of the great confusion which has arisen from this name having been applied by so many authors to the sharp-leaved Senna, which is imported in such large quantities both from Arabia and Egypt, and which was restored by the L. P. of 1851 to its old name, *C. officinalis*.

1. CASSIA LANCEOLATA (*C. officinalis*, P. L. 1851). Fig. 59, taken from Dr Royle's "Illustrations of Himalayan Botany," t. 37. This is a bushy annual, of about 2 to 3 feet in height, extremely leafy, and of most luxuriant inflorescence in a cultivated state. The stems are erect, round, smooth, a little lexuose towards the apex. The leaves alternate, abruptly pinnate. The eaflets 5 to 8 pairs, with short petioles, ovate-acute in the lower and lanceo- ate-acute in the upper part of the plants, "slightly mucronulate, smooth above,

rather downy beneath (especially in young leaves), with the veins turning inwards and forming a flexuose intra-marginal line; petioles without glands; stipules softly spinescent, semihastate, spreading, minute." Racemes axillary and terminal, erect, rather longer than the leaves. Ovary linear, downy, falcate, with a smooth recurved style. Legumes (3) pendulous, membranous, flat, only slightly protuberant over the seeds, oblong, sometimes elliptical, nearly straight, with the upper margin a little curved, tapering abruptly towards the base, and rounded at the apex, of a brown colour, containing from 5 to 8 white rugose seeds (2). These are figured by Gærtner, ii. t. 146. It is probably the *Cassia medica* of Forsk. p cxi., and agrees with his specimen of "Senna Meccæ Lohajæ inveniebatur foliis 5-7 jugis, lineari-lanceolatis," p. 85, of which Forskal states large quantities are yearly exported from the district of Abu-arisch to Jidda. (*C. lenitiva* and *medicinalis* of Bischoff.) This species includes—

a. *C. lanceolata* of most authors, *C. acutifolia*, Hayne ix. t. 41. Nees and Eberm. t. 345. St. and Church. Pl. 30, as *C. Senna*. This represents the form of *Alexandrian Senna*, v. 60, A. (a small leaf), and spec. in Brit. Mus. from Senaar. (*Kotschy*.) It is found in the valleys of the desert to the south and east of Syene or Assouan, and collected for the trade to Cairo, forming 3-5ths or more of Alexandrian Senna.

Fig 59.

b. *C. acutifolia*, called of Delile, Esenbeck, and Eberm. t. 346 (fig. 60, C.) The leaflets are narrower and more tapering towards the apex than the foregoing, as might be expected in a poorer soil and drier climate. This is very much the form of the *Bombay Senna*. Some of the Indian specimens in Dr Rottler's Herbarium closely resemble this variety; also African specimens from Tajowra to the south of the Straits of Bab-el-Mandeb.

c. *C. elongata*, a name applied to the form of *Tinnivelly Senna*, cultivated by Mr Hughes in the south of India; also that cultivated by Dr Royle at Saharunpore, *C. lanceolata*, Royle, Him. Bot. t. 37, and by Dr Wight near Madras, v. fig. 60, B. and spec. in Brit. Mus. It is the *Cassia officinalis* of Gært. and Roxburgh, Fl. Ind. ii. p. 346. It is cultivated by Dr Gibson near Poona.

Dr Brown writes that he has found the lanceolate Senna wild near Kaira in Guzerat. His cultivated specimens, if picked, would form good Senna.

Judging from the best botanical specimens in London, Dr Royle was unable to distinguish these three kinds by any permanent characters; neither dried Senna-leaves cultivated at Saharunpore from good specimens of *Bombay Senna* (that is, ordinary Indian Senna) imported here from India; nor these from *Suna Mukki* sent him by Dr Malcolmson from Aden, and which he states are "the produce of Africa, but in appearance exactly resemble the Arabian Suna. In the market both are sold as one kind, and bring the same price."

2. C. OVATA of Merat, Dict. de Mat. Med. b. 613. *C. æthiopica*, Guibourt. This may be a distinct species, as it is said to have a gland at the base of the petiole and another between each pair of leaflets. The leaflets are in 3 to 5 pairs, exactly oval-acute, slightly pubescent below; the follicles are thin, pale yellow-coloured, one-third smaller than those of *C. obovata*. It is said to be found both in Nubia and Fezzan, and to furnish exclusively the Senna of Tripoli, Séné de Tripoli. It is extremely like a variety of *C. officinalis*. The figure of *C. Senna* in Stevenson and Churchill, Med. Bot. t. 30, quoted by Dr Pereira as representing this plant, is referred to by Dr Lindley as a good representation of *C. acutifolia* of Delile. But Merat and De Lens say of it: "Nous ne le connaissons que par les feuilles et les fruits qu'on en voit dans la commerce." M. Guibourt calls it *C. æthiopica;* but instead of referring to *C. lanceolata* of Colladon, pl. xv. f. e. as representing this species, he says that it is exactly represented by the Séné de Nubie of Nectoux, pl. 2.

3. C. FORSKALII (*C. lanceolata*, Forsk. and Lindley, Fl. Med. p. 259). Leaflets in 4 or 5 pairs, never more; oblong and either acute or obtuse, not at all ovate or lanceolate, and perfectly free from downiness even when young; the petioles have *constantly* a small round brown gland a little above the base. The pods are erect, oblong, tapering to the base, obtuse, turgid, mucronate, rather falcate, especially when young, at which time they are sparingly covered with coarse scattered hairs. (Lindl. *l. c.*) Collected by Dr S. Fischer in Palm-grounds in the valley of Fatmé, flowering at the end of February. Forskal describes this as being distinguished "glandulâ supra basin petioli." It was found by him at Surdud and about Mor. It is called *Suna* by the Arabs, and probably yields some of the Arabian Senna of commerce. Batka supposes this plant to be *C. ligustrina*, and states that it yields none of the officinal Senna.

4. C. OBOVATA, *Colladon*, Hayne, ix. 42. Nees and Eberm. 347. Diffuse herbaceous plant. Leaves equally pinnate, glandless. Leaflets 4-6 pairs (somewhat villous, Roxb.) obovate, obtuse, but slightly mucronate, unequal at the base, the terminal pair more cuneate and larger. Stipules triangular, narrow, and tapering, rather stiff and spreading. Flowers yellow, in racemes. Bracts ovate, cordate, acuminate, concave, single-flowered. Legumes broad, membranous, smooth, lunate in shape, rounded at each end, with an elevated crest over each side on both valves, so as to form an interrupted ridge along the middle of each valve. Seeds 6 to 8, wedge-shaped, rugose as in *C. officinalis*.—A native of Africa, from Senegal (*Fl. de Senegambie*) to the Nile; found in Fezzan by Dr Oudney (*R. Brown*), in Egypt from Cairo to Assouan, Nubia; found in the Adel country near Sultalli (*Mission to Abyssinia*); Desert of Suez; Syria; dry parts of India, as Kaira (*Burns*); Guzerat, Dekkan (*Col. Sykes*), near Delhi, and Valley of Rungush, near Peshawur (*Falconer*); high dry uncultivated lands of Mysore (*Roxburgh, Wight*). It has been cultivated in Italy (*Séné de Italie*), and forms a part of Alexandrian Senna.

This species is very distinct, in its obtuse obovate leaves and crested legumes from the preceding acute-leaved species. *C. obtusa*, Roxb., was probably described from young legumes, as Dr Royle, like Dr Lindley, compared good specimens from Mysore with others from Africa. The *obtusata* (fig. 60. H.) of Hayne does not seem to differ sufficiently from his *C. obovata* (fig. 60, G.) It is possible, however, that there are two very similar species in Africa. Dr Wallich was of opinion that the Indian plant was distinct from the Egyptian, and proposed calling it Cassia Burmanni. Mr H. Grant, late of the India House, favoured Dr Royle with a specimen in flower, collected by him in February at Philæ, which has upon it *both* obovate (H) leaflets and some which are ovate and acute (G)! Lieut. Wellsted's collection contains a specimen from he coast of Arabia, of which the leaflets are obtuse, elliptic, and hairy. This s perhaps the *C. tomentosa* of Delile, *C. Schimperi* of Steudal, found by Batka n Mecca Senna.

The Sennas of commerce may be arranged as follows:—

1. SENNA ALEXANDRINA. *Alexandrian Senna* is an excellent

kind when the genuine lance-shaped leaflets have been picked out; but that commonly employed in this country is apt to be a mixed and impure kind, being made up of the leaflets, much broken, of *C. lanceolata* and *C. obovata*, with some pods and broken leaf-stalks, and often leaves of other plants. It should be used only after having been carefully picked. Picked Alexandrian Senna is of a pale-green colour, with a faint smell. The leaflets are broad-lanceolate, the two sides unequal; they are thicker and shorter than the Indian Sennas.

The lanceolate Senna of Upper Egypt, Nubia, and Senaar yields two crops annnally, the plants being cut down in spring and autumn, and dried in the sun; then the leaves are stripped off, packed in bales, sent to several *entrepôts*, and finally to Boulac in the vicinity of Cairo. It was long the custom to mix here five parts of the lanceolate Senna with *three* parts of the leaflets of *C. obovota*, brought from other parts of Egypt and even from Syria, and also with *two* parts of the leaves of *Cynanchum* (*Solenostemma*) *Argel.* This mixed Senna was that exported from Alexandria. On the Continent a further addition was made of the leaves *Colutea arborescens* and of *Coriaria myrtifolia.* But now that public attention has been drawn to this system of wholesale adulteration, it appears to have been to a great extent discontinued, the leaves of the two Cassias being for the most part alone found.

Dr Pereira states that, "under the name of *heavy senna* he has met with *argel* leaves, which were sold at a higher price than ordinary senna;" and Dr Christison mentions what indeed has often been seen, that is, Argel leaves left intermixed even in what was called Picked Alexandrian Senna.

This Senna is often called "Séné de la Palthe."

2. SENNA INDICA. *Tinnivelly Senna* (referred by the B. P. to *Cassia elongata*, Lemaire) was first cultivated in the district of that name, in 12° of N. lat., by the late Mr Hughes, from seeds probably obtained from Arabia, or picked out of *Suna Mukki*, as was done by Dr Royle when he cultivated Senna at Saharunpore (*see* Himal. Bot. p. 186, t. 37, and Trans. Med. Soc. of Calcutta, v. p. 433). Dr Royle also grew Senna from Tinnivelly seed sent out to him by Sir C. afterwards Lord Metcalfe; but he did not find the smallest difference between the two when grown in the same situation. The Tinnivelly Senna is well grown and carefully picked; the leaflets are of a fine rather lively green colour; thin but large, being from one to two inches in length, truly lanceolate. "It is of a light pea-green colour, very thin and membranous, flexible, having a sour, vinegar-like smell, as if it had undergone the acetous fermentation while drying." (Wight.) It sustains great loss of weight in keeping. This kind is "highly esteemed in this country, and is quickly displacing all the other sorts in this (Edinburgh) and many other cities in Britain." (Christison.) Dr A. T. Thomson says that it is mild in operation, certain as a purgative, and operates without griping. It is now cultivated by Mr Hughes' successor.

Saharunpore Senna, the same kind of Senna cultivated at Saharunpore, differed only in the leaflets being smaller, as might be expected from the more northern latitude (30°). These Dr Royle prescribed in the hospitals at Saharunpore, and found them effective as a purge, and operating without producing inconvenient nausea or griping. Mr Twining, after trying them in forty-five cases in the General Hospital at Calcutta, says in his report to the Medical Board—"From these trials I am disposed to consider the Senna now under trial equal to the best I have ever seen."

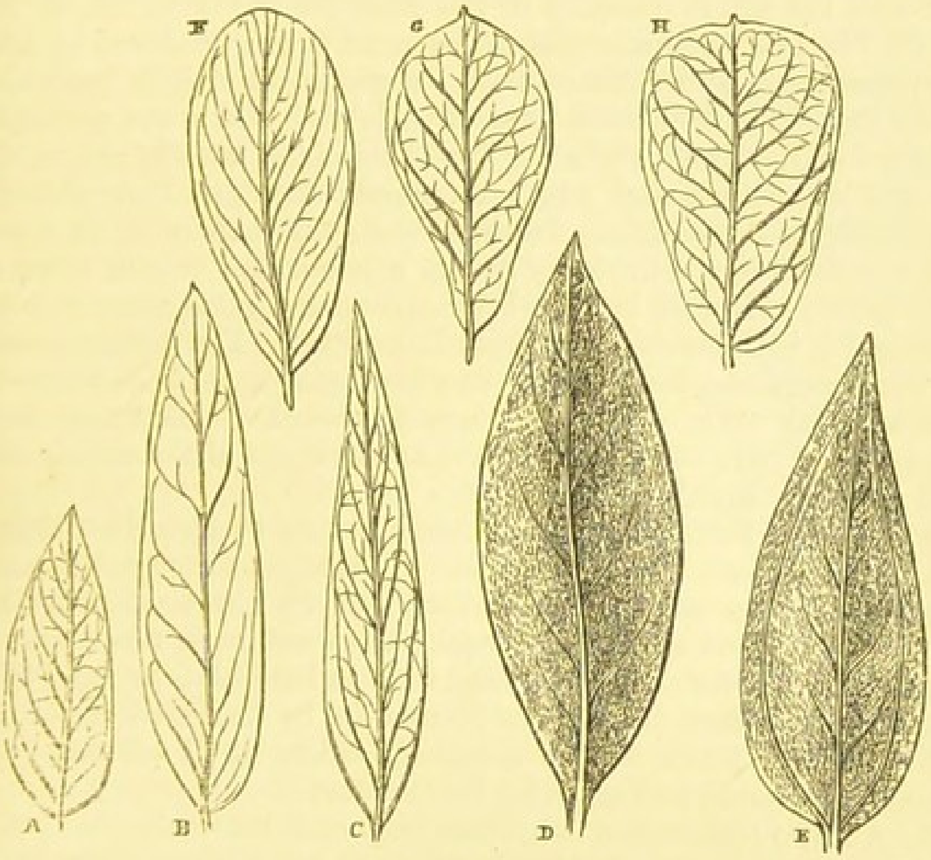

Fig. 60.

A. Cassia lanceolata. B. Tinnivelly Senna. C. C. acutifolia. D. Cyanchum (or Solenostemma) Argel. E. Coriaria myrtifolia. F. Tephrosia Apollinea. G. C. obovata. H. C. obtusata.

Madras Senna.—Senna is now imported also from Madras, the produce of that Presidency. In 1843–44, 11,536℔ were exported to this country, having been previously imported into Madras from Tinnivelly, where it is cultivated by the natives, and is of the same nature as Mr Hughes' Senna, though not so well known nor so carefully picked. Dr Christison says of it, the leaflets are longer than those of Bombay Senna, and not so taper-pointed, but otherwise differ only in being better preserved, and, being more active, are more esteemed.

Dr Searle, in a communication to the India House, says of this Senna, "that now furnished to the profession by the Madras Government is in my experience quite as good as the Alexandrian," "every leaf of the Indian being of the genuine spear-shaped species."

These three kinds of Indian Senna may be referred to the variety *elongata* of *C. lanceolata*, a peculiarity in form which depends upon the conditions of cultivation.

3. SENNA ARABICA *v.* AFRICANA. *Bombay* or *Common Indian Senna*, *Suna Mukki* of the natives, is first imported into Bombay from the Arabian Gulf. That this Senna forms a large, if not the largest proportion of what is consumed in this country, is not only evident from the statistics of importation, but also from a comparison with the whole quantity of the other Sennas imported, as given by Dr Pereira. Some of this Senna is no doubt produced in Africa, as stated above by Dr Malcolmson; a good deal of it in Arabia, probably by *Cassia lanceolata* (var. *acutifolia ?*), and some perhaps by *C. Forskalii.* The leaflets are thin, lanceolate, usually entire, about an inch or an inch and a-half in length, narrower than either the Tinnivelly or Saharunpore Senna, probably from growing in a poorer soil and drier climate. They are of a pale-green colour, often with dark-brown coloured leaflets intermixed, also some pods, and many leaf-stalks, with occasionally other impurities. The better specimens of this Senna are, however, of excellent quality, and its commercial and medical value would be much increased, if the finest leaflets were picked out. It is in constant use in hospital practice in India, and generally highly approved of.

4. TRIPOLI SENNA is brought from Fezzan to Tripoli. This has the general appearance of Alexandrian Senna, but though it is a purer Senna it is less esteemed, probably because the leaflets are more broken down, and all the leaf-stalks have not been removed. The leaflets are shorter and less pointed than in lanceolate Senna—indeed more ovate; hence this Senna is said to be produced by *C. ovata* (*C. æthiopica*); but it also contains leaflets of *C. obovata*, which species was found in Fezzan by Dr Oudney.

5. ALEPPO SENNA is now seldom imported into this country. It consists of the leaflets of *C. obovata*, as do some other kinds, such as ITALIAN SENNA. Dr Ainslie says that the *obovate* is the only kind of Senna met with in India, meaning the Peninsula of India; for it is not met with in the Bengal Presidency; nor, according to Dr Searle, is it used in that of Madras at the present day. It is less effective as a purgative, and apt to create nausea and griping.

Adulteration.—Commercial Senna is prepared for use by picking out the leaflets, and rejecting the leaf-stalks, with extraneous matters, as dust, date-stones, &c., as well as the leaves of other plants. The legumes, however, possess the cathartic properties of the leaves to a considerable extent, and were alone used by the original Arabs; and there is no reason to believe that the stalks are inert. The most important adulterations are, however, the leaves of other plants. Those of the *Argel* (D.) may be distinguished by being lanceolate, equal on the two sides of the midrib, thick, leathery, and paler. They operate very dubiously as a cathartic, but occasion griping and protracted sickness. (*c.*) Those of *Tephrosia Apollinea* (F.) are obovate downy, and the veins proceed transversely from the midrib to each margin of the leaf without forming a marginal vein. The leaves of *Colutea arborescens*, or Bladder Senna, are ovate, but equal at the base. Those of *Coriaria myrtifolia* (E.) are astringent, usually broken down, and marked on each side of the midrib with a strong lateral nerve. The systematic adulteration of Senna in Egypt with the leaves of other plants has been for the main part discontinued of late, on account of the indignation which the practice excited among English Pharmaceutists. In India a good substitute for Senna is afforded by *Rae Suna* (*see* COMPOSITÆ).

Prop.—Senna has a faint sickly smell; its taste is slightly mucilaginous, bitter, and nauseous. Alexandrian Senna, analysed by MM. Lassaigne and Feneulle, yielded Mucilage, Albumen, Chlorophyll, Fixed Oil, a little Volatile Oil, yellow Colouring Matter, and some Salts. Its properties are supposed by some to depend upon *Cathartine*, which is described to be a deliquescent uncrystallisable matter. The pods are composed of the same principles, with the exception of the Chlorophyll. M. Heberlein has experimented upon this Cathartine, and describes it as a dark-brown clear extract, with an unpleasant odour, and an acidulous, bitter, unpleasant taste; perfectly soluble both in Alcohol and water. He considered it to be merely an extract, containing a free Vegetable acid, a Salt with an alkaline base, and a Brown Bitter Extractive. He further found that it did not contain the purgative principle of the Senna. Gr. v. from 120 gr. of Senna leaves, and even gr. x., given to patients, were inefficacious; also four doses of gr. xx. each, taken by himself at intervals of an hour and-a-half, were without effect.

The active principles of Senna are extracted both by rectified and by proof Spirit, and by cold and hot water; but long boiling injures its properties as a medicine. A very useful set of experiments has been made by Mr Deane (P. J. iv. 61), from which he finds that though the best result was obtained by macerating Senna in a weak Spirit, yet that cold water extracts the soluble and active portions nearly if not quite as well as hot water; and that picked Alexandrian Senna of the best quality is superior to all the others in the quantity of extract it yields. Of the East Indian, that from Tinnivelly is best; and the common East Indian is better than small Alexandrian. But it has not been proved that the purgative property is in proportion to this Extract. He found that Senna 7½ oz. troy were completely exhausted by Dil. Spirit (1 part Spirit to 5 of water) 20 fl. oz., and the product four times the strength of the Inf. Sennæ.*

Action. Uses.—Purgative; safe and efficient, acting chiefly on the small intestines, and producing copious loose evacuations, in doses

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* On the contrary, M. Heberlein states that spirit is a most inefficient solvent of the active principle of Senna; and that leaves which have been exhausted by this menstruum are still most energetic in producing purging. (P. J. viii. 400.)

of gr. xxx.–gr. cxx., as in some of the following forms, or with Bohea Tea (Paris), or with Coffee, as in the French *Café au Séné.*

INFUSUM SENNÆ, B. Infusion of Senna.

Prep.—B. Infuse for an hour in a covered vessel *Senna*, ℥j.; sliced *Ginger*, gr. xxx. in boiling *Aq. dest.*, ℥x., and strain. (Same strength as L., twice as strong as B. 1864.)

This infusion has the odour and taste of Senna, and is of a clear brown colour. It is much employed as a purgative in doses of f℥j.–f℥ij., often in combination with a saline purgative, and a warm or purgative Tincture, forming the common *Black Dose.*

MISTURA SENNÆ COMPOSITA, B. Compound Mixture of Senna. *Black Draught.*

Prep.—Take of *Sulphate of Magnesia*, ℥iv.; *Extract of Liquorice*, ʒß; *Tincture of Senna*, f℥iiß; compound *Tincture of Cardamoms*, fʒx.; *Infusion of Senna*, a sufficiency. Dissolve the Sulphate of Magnesia and Extract of Liquorice in f℥xiv. of the infusion of Senna, with the aid of a gentle heat, then add the tinctures, and sufficient infusion of Senna to make Oj.

Introduced in 1867. Resembles the Black Draught long used in practice.

Dose.—f℥j.–f℥jß.

TINCTURA SENNÆ, B. Tincture of Senna.

Prep.—Take *Senna*, broken small, ℥ijß; *Raisins*, freed from seeds, ℥ij.; *Caraway*, ʒß; *Coriander*, ʒß; *Proof Spirit*, Oj. Prepare as Tinct. Aconiti.

A warm and stimulant purgative. Usually prescribed as an adjunct to the Infusion, in doses of fʒj., sometimes alone in doses of f℥ß.

SYRUPUS SENNÆ, B. Syrup of Senna.

Prep.—B. Take of *Senna*, broken small, ℥xvj.; *Oil of Coriander*, ♏iij.; *Refined Sugar*, ℥xxiv.; *Distilled water*, Ov., or a sufficiency; *Rectified Spirit*, f℥ij. Digest the Senna in ℥lxx. of the water for twenty-four hours, at a temperature of 120°; press and strain. Digest the mark in ℥xxx. of the water for six hours at the same temperature; press and strain. Evaporate the mixed liquor to f℥x., and, when cold, add the Rectified Spirit, previously mixed with the Oil of Coriander. Clarify by filtration, and wash what remains on the filter with Distilled water, until the washings make up the filtrate to f℥xvj. Then add the Sugar, and dissolve by means of a gentle heat. The product should weigh ℔ij. ℥x., and should have the specific gravity 1·310.

The L. P. used Fennel seeds with Treacle and Manna, instead of the Coriander and Sugar.

It has but little of the taste of Senna, causes little sickness or griping, and is effective as a purgative. A "Concentrated Syrup of Senna" has for some time been prepared in the metropolis. The following, or "Fluid Extract of Senna," has been strongly recommended by Dr Christison (*see* P. J. iii. 115 and 248), and is prepared by several druggists.

Take of *Tinnivelly Senna*, ℔xv. avoirdupois, and exhaust it with boiling water by displacement; (about 4 times its weight of water is sufficient). Concentrate the infusion in vacuo to ℔x.; dissolve it in *Treacle* ℔vj., previously concentrated over the vapour bath till a little of it becomes nearly dry on cooling; add of *Rectified Spirit* (Sp. Gr. ·835) f℥xxiv.; and, if necessary, add *water* to make Oxv. Every f ℥ will correspond to Senna ℥j. avoirdupois.

Dose.—fʒij. for an adult. It tastes like treacle, the feeble mawkish one of Senna being covered; and it operates usually without producing either nausea or griping. Dr C. informed Dr Royle that a patient who had been in the habit of taking this Syrup made from Tinnivelly Senna, immediately discovered when the Alexandrian had been used, in consequence of the severe griping and its ineffectual teasing effect as a purgative, though taken in the same doses. There can be no doubt of the superiority of the Tinnivelly and other pure Sennas.

CONFECTIO SENNÆ, B. Confection of Senna.

Prep.—B. Take of *Senna*, in fine powder, ℥vij.; *Coriander*, in fine powder, ℥iij.; *Figs*, ℥xij.; *Tamarinds*, ℥ix.; *Cassia Pulp*, ℥ix.; *Prunes*, ℥vj.; *Extract of Liquorice*, ℥¾.; *Refined Sugar*, ℥xxx.; *Distilled water*, f℥xxiv. Boil the Figs and Prunes gently with ℥xxiv. of Distilled water in a covered vessel for four hours, then, having added more Distilled water to make up the quantity to its original volume, mix the Tamarind and Cassia Pulp, digest for two hours, and rub the softened pulp of the fruits through a hair sieve, rejecting the seeds and other hard parts. To the pulped product add the Sugar and Extract of Liquorice, and dissolve them with a gentle heat; while the mixture is still warm, add to it gradually the mixed Senna and Coriander powders, and mix the whole thoroughly, making the weight of the resulting confection ℥lxxv., either by evaporation or by the addition of more Distilled water.

Action. Uses.—A mild but useful purgative in doses of gr. lx.–ʒß.

The bark of the ANDIRA INERMIS, or Cabbage Tree, a native of the West Indies, has been used in medicine for its anthelmintic and emetic properties. It was formerly officinal in the D. P.

COPAIBA, B. Oleo-resin obtained from the trunk by incision. Copaifera multijuga, *Hayne*, and other species. Fluid-resinous exudation of several species of Copaifera. Copaiva Balsam.

Copaiba was first described by Marcgraaff and Piso in 1648; but the species intended is uncertain, as the latter gives no figure, and the former only one of the fruit (supposed by some to be that of *Copaifera bijuga*, Willd.). Jacquin, in 1763, described a species of Copaifera from Martinique, which he named *C. officinalis*, and which probably yields the little Copaiba obtained from the West Indies. It has, however, been ascertained that several species yield the Copaiba of commerce. The Wood Oil of some spiecies of Dipterocarpus yields a substance closely resembling Copaiba.

The Balsam of Copaiba of commerce is chiefly obtained from the Brazils (from the Valley of the Amazon, B.); a very little being imported from Guiana and the West Indian islands. It is yielded by several species.

COPAIFERA, *Linn.* *Decand. Monog.* Linn.

Calyx without bracts, 4-parted, divisions small, spreading; corolla, none; stamens 10; separate, nearly equal, declinate; ovary compressed, with two ovulves; fruit a legume, stalked, obliquely elliptical, coriaceous, somewhat compressed, 2-valved, 1-seeded; seed elliptical, enclosed in a 1-sided aril; embryo straight; radicle somewhat lateral.—Trees or shrubs of tropical America. Leaves alternate, equally or unequally pinnate; leaflets opposite or alternate, coriaceous, somewhat unequal, ovate, either dotted or not. (*Lindl.*) Stipules generally wanting; bracts caducous; flowers in compound axillary and terminal spikes.

Fig. 61.

1 *C. Langsdorffi*, Desf. (*see* fig. 61). Leaflets 3-5 pairs, equal-sided, obtuse, with pellucid dots; the leaves ovate, the upper elliptical; petioles and peduncles slightly downy.—San Paulo and Minas.

2. *C. multijuga*, Hayne. Leaves equally pinnated; leaflets 6-10 pairs, somewhat incurved, unequal-sided, with a long tapering point, and pellucid dots,—the lower ovate oblong, the upper lanceolate.—Para.

3. C. coriacea, *Mart.*	San Paulo and Minas.	6. C. nitida, *Mart.*	Minas Geraes, and Goyaz.
4. C. guianensis, *Desf.*	Rio Negro, Para.	7. C. Beyrichii, *Hayne.*	Rio and Estrella.
5. C. Martii, *Hayne.*	Para, Maranhao.	8. C. officinalis, *Linn.* C. Jacquini, *Desf.*	West Indies, and Venezuela.

Copaiva, though usually called a Balsam, is not correctly so named, as it contains no Benzoic (or Cinnamic) acid. It is an Oleo-Resin, which varies more or less in colour, odour, specific gravity, and medical virtues, according to the species from which it is obtained. (*Martius.*) The species 1 and 3 yield the best Copaiva in the district of San Paulo, 4 in Guiana, 2 and 5 in Para, 6 in Minas Geraes, 7 in the mountains of Estrella and at Rio, 8 in Venezuela and the West Indies. Other species are productive, and no doubt yield some of the Copaiva of commerce. Most of the balsam, however, is obtained from Para and Maranhao; and this is probably yielded mainly by *C. multijuga*, as stated in the B. P. Dr Christison mentions Copaiva sent from British Guiana, obtained from plants growing farther north than the above (except No. 8), and near the Orinoco, the species of which botanists have not yet determined. The species growing in the hot and moist parts of Brazil form large trees, and yield very fine Copaiva; those of the drier and interior districts, as Minas Geraes, &c., are shrubby in nature, and yield less, but also a more resinous balsam; that of the West Indies is darker-coloured, turbid, more acrid in taste, and smells more of turpentine. It is in all these places obtained by making deep incisions into the trunks of the trees, chiefly at the end of the rainy season, when it flows out so abundantly, that 12℔ are said by Piso to be obtained in a few hours.

Prop.—Balsam of Copaiva is a liquid (Sp. Gr. 0·95) of an oily consistence, transparent, of a pale straw-colour, of a strong odour, and disagreeable, nauseous, acrid taste. It becomes more dense and darker-coloured if kept exposed to the air. It is soluble in Alcohol, Ether, and Oils; but, like other Oleo-Resins, insoluble in water. With alkalies it forms soaps, which are precipitated when much diluted with water. Analysed by Stolze and Gerber, it yielded of Volatile Oil from 32 to 34 parts, Yellow Resin (*Copaivic acid*) 38 to 52, Viscid Resin 1·65 to 2·13, the rest being water and loss in 100 parts. The *Volatile Oil* may be separated by distillation with water. (*See* Oleum Copaibæ.) The Resin which remains consists of two parts: one, *Copaivic acid*, hard, brittle, and crystallisable, having an acid reaction on Litmus, and forming compounds with bases: like Colophane or Pinic acid, it consists of $C_{40}\,H_{32}\,O_4$. The other, *soft*, *brown*, or *viscid Resin*, which is more abundant in old than in fresh Copaiva, has little affinity for bases, and may be separated from the other by being insoluble in Naphtha. Mr Lowe has remarked that strong Sulph. acid produces a purple coloration with Bals. Copaiba, similar to that formed with Cod-liver oil. He also states that most specimens of Copaiba, when distilled with 2 per cent. of Sulph. acid, or Bichrom. Potash, produce a blue volatile oil. This is ascribed to the oxidation of the hard resin.

Copaiba generally is perfectly soluble in rect. Spirit, and in an equal volume of Benzole, and dissolves ¼th of its weight of Carbonate of Magnesia, remaining transparent.

The balsam usually met with forms a clear solution with solutions of Potash or Ammonia, and is readily soluble in Alcohol. But in 1849 M. Possett described a new variety of Copaiva, imported also from the Brazils, which would not mix with alkaline solutions, and was imperfectly soluble in Alcohol. It possessed the peculiar odour and taste, and the external characters of good Copaiva. The *Wood Oil* of various species of Dipterocarpus has been extensively imported into England of late years. It comes from Moulmein in Burmah, and from various parts of India, being obtained in Bengal from *D. turbinatus* and other trees of the same genus. It strongly resembles true Copaiba in many of its characters. But it is darker in colour, and has the curious property of becoming solid when heated in a closed phial to 266° F.

Tests.—Transparent, soluble in Benzole, dissolves Carbonate of Magnesia. An inferior kind, or some adulterated with Turpentine or fixed Oils, is occasionally sold. A greasy spot will be left, if any fatty oil is present, when a little is dropped on bibulous paper. Many spurious kinds are met with. The B. P. states that it should not be fluorescent, nor become gelatinous when heated to 270°. (See above.)

Action. Uses.—Stimulant of Mucous Membranes, especially of the Urinary passages. In large doses Cathartic and Diuretic. Diminishes Mucous discharges, as of Gonorrhœa, &c.

Dose.—♏xv.–♏xxx. or even lx., 2 or 3 times a-day, swimming on some fluid, or made into an emulsion; or in capsules, where the Copaiva is enclosed in a thin layer of Gelatine; or in the form of pill, with $\frac{1}{16}$ of Magnesia, as in the U. S. P.

OLEUM COPAIBÆ, B. Volatile Oil of Copaiva.

Prep.—Distil. *Copaiva* f℥j. with *Water* Ojß, and separate the Oil.

Action. Uses.—This oil is colourless, but acrid in taste, with a strong odour of Copaiva, soluble in Alcohol, Ether, &c. It consists, like Oil of Turpentine, of C_{10} H_8. It is preferred by many to every other form of Copaiva, in doses of ♏x.–♏xxx.

Sub-ord. III. PAPILIONACEÆ, *Lin.* *Nat. Ord.* Papilionads.

The corolla is irregular, papilionaceous; of 5 segments, the 2 upper united, the lowest keeled. Stamens 10; monadelphous, or diadelphous, 9 united in a bundle, and 1 alone.

The Papilionaceæ may be distinguished by their irregular flowers, number and insertion of the stamens, and by the leguminous fruit, as well as by their habit; but the most doubtful may be distinguished from Rosaceous flowers by the odd segment of the calyx being anterior. Papilionaceæ are found in all parts of the world; their geographical distribution is best studied in their several tribes. Uses various.

BALSAMUM PERUVIANUM, B. Balsam obtained from the stem by incision. (From Salvador in Guatemala.) Myrospermum Pereiræ, *Royle.* Myroxylon Pereiræ, *Klotzsch*, B. P. Balsam of Peru.

BALSAMUM TOLUTANUM, B. Myroxylon Toluifera, *H. B. K.* Balsam obtained from the stem by incision. (Tolu in New Granada.) Balsam of Tolu.

The Balsams of Peru and Tolu were first made known by Monardes in the year 1580. Mutis sent a branch in flower of the tree supposed to produce the first in 1781 to the younger Linnæus.

Balsam of Tolu was long thought, as stated by Ruiz, to be produced by the same tree. Miller having, however, grown it from seeds sent him from the province of Tolu behind Carthagena, considered it distinct, and continued to call it *Toluifera balsamum.* Collected by Humboldt and Bonpland, it was described by Kunth as *Myroxylon toluiferum.*

Ach. Richard, having examined the characters of these species, found them all to belong to the genus *Myrospermum* of Jacquin, in which they have been continued by other botanists. Klotzsch of Berlin, however, has, after a careful examination of all known species, assigned the plants producing the balsams of Peru and Tolu to the old genus Myroxylon of Kunth. In Myroxylon the filaments of the stamens are deciduous ; in Myrospermum they are persistent. As the flowers of *M. Pereiræ*, described below, are as yet unknown, and the plant resembles the known species of Myrospermum, we retain for it at present the name originally given to it by the authors of this work. (*See* Klotzsch in *Bonplandia*, Hanover, Sept. 15, 1867).

MYROSPERMUM, *Jacquin*. *Decand. Monog.* Linn.

Calyx campanulate, slightly 5-toothed; petals 5, subpapilionaceous, the upper largest; stamens 10, free; ovary stipitate, oblong, membranous with 2–6 ovules, terminated with a lateral filiform style; legume with a winged stalk, which is very broad at the apex, and which supports an oblique, indehiscent, 1-celled, 1 to 2-seeded samaroid fruit; seeds involved in balsamic juice; cotyledons fleshy; embryo curved. Trees with abruptly (*Dec.*) imparipinnated (*Kunth*) leaves; leaflets marked with round and some linear dots.

M. peruiferum, Dec. was long supposed to yield the Balsam of Peru of commerce, but it is probably not the true Quino-quino, or Balsam of Peru tree, about which there have been a number of discrepant accounts. A distinct plant was described by Ruiz as *M. peruiferum ;* it has been named *M. pubescens* by Kunth. *M. pedicellatum* was found in Peru by J. de Jussieu, and stated by him to yield the balsam.

The latest and most authentic intelligence on the subject of the plant producing balsam of Peru was communicated by Dr Pereira to the Pharmaceutical Journal (vol. x. Nos. v. and vi.) In November 1850, Dr Pereira received from Mr Skinner, late a merchant in Guatemala, specimens consisting of the leaves and fruit of a plant growing on the Sonsonate coast of San Salvador, and yielding Balsam of Peru. This plant he at first supposed to be *M. pubescens*, Kunth, but he afterwards found that it differed both from this and from all known species. Dr Royle, in the third edition of this work, gave to the species the name of his friend, who first described it.

MYROSPERMUM PEREIRÆ, *Royle*. (Myroxylon, *Kl.*)—Branches terete and warty; otherwise smooth, ash-coloured. Leaves alternate, stalked, imparipinnate. Common petioles apparently smooth, but covered with short microscopic hairs. Leaflets 5–11, alternate, with short petioles; about 3 inches long and 1¼ inch wide; generally oblong or oval-oblong, rounded or slightly tapering at the base, contracting abruptly to an emarginate point; seen in a strong light, and with a magnifier, to be elegantly marked with roundish or linear pellucid spots, the lines being in the direction of the primary veins. Partial petioles and midribs covered also with microscopic hairs. *Flowers unknown.* Fruit a 1-celled, 1-seeded, winged, indehiscent pod; fruit-stalk naked at base, but amply winged above; fruit, including stalk, usually about 3¼ inches long; at the peduncular extremity rounded, unequal-sided; at the summit enlarged, tumid, and rounded, with a small point at the side, being the remains of the style. The mesocarp is fibrous; but, immediately outside the endocarp, there are receptacles containing a yellow oleo-resinous juice, which hardens in time. Seed inside loose and dry; cotyledons yellowish, oily, having an agreeable odour.—Sonsonate coast.

Along with these specimens, Dr Pereira obtained some reliable information as to the country and mode of production of Balsam of Peru. It has been supposed to be produced on many parts of the western coast of South America; but it appears that it is now only produced by the *Balsam Coast*, in the neighbourhood of Sonsonate, State of St Salvador, Guatemala, and not by Peru at all. This coast is limited in extent, reaching from the port of Acajutla to that of Libertad. From the tree in question Balsam of Peru is obtained by the Indians, who bring it to market at Sonsonate. It is called by them *Balsamo Negro*, Black Balsam. It is obtained by cutting the trees at the proper season, at the same time slightly burning the bark; what exudes is allowed to soak into rags inserted in the apertures; these are afterwards boiled in water, and the balsam skimmed off the surface. It has to be strained before it is fit for exportation. The whole average annual yield is stated to be about 25,000℔. A semi-solid substance, called *Balsamo Blanco*, or White Balsam, is obtained by expression of the seeds and inner portion of the fruit of the same tree. It has been confounded with Tolu Balsam, but is quite distinct from it, and without its peculiar odour. Besides these two products, a fragrant liquid, called *Balsamito*, in high repute throughout Central America as a stimulant and vulnerary, is prepared by digesting in rum the inner part of the fruit of this Myrospermum.

Balsam of Peru is of a viscid syrupy consistence. Sp. Gr. 1·15, of a reddish-brown almost black colour, of a strong balsamic odour, and a bitterish rather acrid taste. It burns with a good deal of smoke. Boiled in water, an acid and a little volatile oil are separated from it. It is entirely soluble in Alcohol, and in about 5 parts of rectified Spirit. It appears to consist of three chemical compounds. *Cinnameine* (or *Styracine*) is a peculiar acrid oil, heavier than water, constituting about 70 per cent. By the action of caustic potash it is decomposed into Cinnamic acid, which combines with the potash, and a light oily fluid called Peruvine. *Cinnamic acid* constitutes about 6·4 per cent. of the balsam. It is colourless, crystalline, and soluble, and may be formed by exposing oil of Cinnamon to the air, or from Cinnameine, as just stated. Formula, $C_{18}\,H_7\,O_3$, $H\,O$. *Resin of Peru* forms about 24 per cent. of fresh balsam. It is formed simply by the union of Cinnameine with the elements of water, being thus a hydrate of Cinnameine. It increases in quantity gradually, at the expense of the oil, when the balsam is hardened by keeping.

Bals. Peru is occasionally adulterated with Castor oil, Bals. Copaiba, and other liquids. If pure, it should yield a brittle resinous substance on being mixed with twice its weight of concent. Sulph. acid, and then slightly diluted with water.

MYROXYLON, K.

Stamens with deciduous filaments. Otherwise resembles Myrospermum.

MYROXYLON TOLUIFERA, *H. B. K.* MYROSPERMUM TOLUIFERUM, *Ach. Rich.*—A tree very like *M. peruiferum*. Branches warty, smooth; leaflets equilateral, from 7 to 8, thin, membranous, ovate, oblong, acuminated, rounded at the base, shining, and as well as the rachis, smooth. The leaves only are figured by Nees von Esenbeck in T. 322; but they are so similar to those of the plant he has figured as *M. peruiferum*, that they might belong to the same plant. Mountains of Turlaco near Carthagena; banks of the Magdalena and the high savannahs of Tolu.

Balsam of Tolu is probably obtained by incisions made in the bark of the above tree. It is imported from Carthagena, &c., in vessels of different kinds, sometimes in small ovoid gourds. Ruiz stated that it was only the Balsam of Peru in a dried state. And Dr Weddell found a substance which he supposed to be the Balsam of Tolu lying at the foot of *M. peruiferum* in Bolivia. But the geographical source of the two Balsams constitutes a ground of distinction, for it appears that the so-called Bals. Peru is not obtained from that country, nor yet from Bolivia. Acccording to Fremy, Tolu is composed of the same constituents as the other, and will act in a similar manner with reagents. It is usually in a solid state, dry and friable, of a yellowish-red or reddish-brown colour; but when fresh, it is soft, and of a consistence of thick honey, from containing more oil, of a fragrant balsamic odour, and warm sweetish taste.

Action. Uses.—Stimulant, Expectorant. The Balsam of Peru is a useful application to indolent and also to phagedenic ulcers. Stimulant Expectorant in Chronic Catarrhs, in doses of ♏xv.–♏xxx. made into emulsion with Mucilage or Yolk of Egg. The Balsam of Tolu is more frequently prescribed.

TINCTURA TOLUTANA, B. Tincture of Tolu.

Prep.—B. Macerate *Balsam of Tolu* ℥ijß in *Rectified Spirit* ℥xv. for six hours, or until the balsam is dissolved, and filter. Add *Rectified Spirit* to make up Oj. (More than twice as strong as the L. Tincture.)

Dose.—♏xv.–fʒß made into an emulsion.

SYRUPUS TOLUTANUS, B. Syrup of Tolu.

Prep.—B. Take of *Balsam of Tolu*, ℥j¼; *Refined Sugar*, ℔ij.; *Distilled water*, Oj., or a sufficiency. Boil the Balsam in Water for half-an-hour in a lightly-covered vessel, stirring occasionally. Then remove from the fire, and add Distilled water, if necessary, so that the liquid shall measure ℥xvj. Filter the solution when cold, add the Sugar, and dissolve with the aid of a steam or water bath. The product should weigh ℔iij., and should have the specific gravity 1·330. (About twice as strong as the L. Syrup.)

Action. Uses.—Stimulant in doses of fʒß–fʒj. Sometimes added to flavour draughts.

Ph. Prep.—Tinct. Benzoini Comp. B. Trochisci Opii, Troch. Morphiæ, and Troch. Morphiæ et Ipecacuanhæ, B.

PTEROCARPUS, *Linn.* *Diadelphia Decandria*, Linn.

Calyx 5-toothed, obscurely bilabiate; petals 5, papilionaceous, petals of the keel free; stamens 10, filaments variously united; ovary stipitate, with few (2 to 4) ovules; legumes suborbicular, compressed, indehiscent, surrounded by a membranous wing, usually rugose in the middle; 1–3 celled, each cell 1–3 seeded; seeds kidney-shaped.—Trees or shrubs. Leaves unequally pinnated racemes axillary or terminal, and paniculate. Natives of the tropical parts of India, of the west coast of Africa, and of tropical America; they secrete and exude reddish-coloured juice, which is usually astringent, and hardens in the air.

PTEROCARPI LIGNUM, B. Pterocarpus santalinus, *Linn. fil.* The wood. Red Sandal Wood. (From Ceylon.)

Sandal-wood is mentioned by Serapion and other Arabs, and distinguished into white, yellow, and red. The last is known in commerce as Red Saunders Wood. This is called *rukta chundun* (red Sandal) in India, and the name is applied to the wood of *Pterocarpus santalinus*, and also to that of *Adenanthera Pavonina.* Lignum Pavona was an old dye-wood. That of *Pterocarpus dalbergoides* is said to yield the Andaman Red Wood.

P. SANTALINUS, *Linn. fil.* (*Santalum rubrum*, Kœnig.)—A lofty tree. Leaflets 3, rarely 4 or 5, alternate, roundish, retuse, smooth above; racemes axillary, simple, or branched; petals long-clawed, crenate, undulate; standard yellow, streaked with red; filaments 10, diadelphous (triadelphous, 5, 4, and 1, *W. and A.*); legume suborbicular, stalked, 1-seeded; the wing somewhat membranous, waved. A native of the Pulicat (Paulghat) mountains; also of Ceylon.

This tree was pointed out by Kœnig as yielding Red Sandal-wood. Its wood is dark-red with dark-coloured veins, heavy and compact, capable of taking a fine polish; when moistened with water, it is said to produce a fine red colour; and a reddish-coloured juice exudes from its bark, which Kœnig considered a kind of dragon's blood. The imported wood is similar in appearance, is without odour, has a feeble taste, and sinks in water. It is obtained from Coromandel and Ceylon, in dense heavy billets and chips. Alcohol and Ether readily extract its colour, as do alkaline solutions. Pelletier found it contained Woody Fibre, Extractive, Gallic acid, and about 17 per cent. of a peculiar colouring matter, which he called *Santaline*, and which is somewhat allied to the Resins in its properties.

Action. Uses.—Used only as a dye, and to give colour to the Tinct. Lavandulæ Comp.

KINO, B. Pterocarpus Marsupium, *DC.* The juice obtained from incisions in the trunk, inspissated. (From Malabar.)

Kino is well known as an astringent substance, in small and shining, brittle, angular fragments of a deep-brown colour, which would seem to be a natural exudation of some one plant, from the uniformity of its appearance. Several kinds of Kino are, however, met with in commerce, as well as described in books, as that of *Butea frondosa* from India, at one time acknowledged by the D. C., and which has no doubt been sometimes imported as Kino. Botany Bay Kino, produced by *Eucalyptus resinifera*, or Brown Gum Tree, at one time acknowledged by the E. C.,—a Jamaica,—and a Columbian Kino,—are mentioned; and an extract of Rhatany is sometimes enumerated with them. The genuine Kino has been supposed to come from the west coast of Africa. There is no doubt, however, and the fact may be easily ascertained by any one making inquiries in the proper channels, that the best is now imported into this country from Bombay.

Kino seems to have been first introduced into European practice by Dr Fothergill, in 1757, who states, in a paper in Med. Obs. and Enq. i. 358, that he was indebted for information respecting it to Dr Oldfield, and that the substance was obtained from the river Gambia, whence he called it *Gummi rubrum astringens Gambiense.* Previous to this, Moon, in his travels in Africa, mentions a red gum as issuing from incisions in trees, and which he mistook for Dragon's-blood. Mungo Park discovered that the tree which yielded this substance was called Pao de Sangue (Blood-tree) by the Portuguese. His specimens were determined by Mr R. Brown to belong to *Pterocarpus erinaceus,*—a tree which has since been well figured and fully described in the Flore de Senegambie.

The origin of the name Kino has not yet been satisfactorily ascertained. It was introduced into the E. P. 1774 as *Gummi Kino*, and into the L. P. 1787 as *Resina Kino.* Dr Royle was of opinion that the name was derived from the Indian *kuenee* or *kini*, applied to a similar exudation from the bark of *Butea frondosa*, of which the Sanscrit name is *Kin-suka* (*Himal. Bot.* p. 195, and *Proc. Royal Asiatic Soc.* p. 50, May, 1838), because this *Butea gum* had been sent as Kino to the above Society from Bombay. An old specimen in the India House is marked *Gum Cheena.* Dr Pereira, several years since, found "in the warehouse of an old drug firm in London, a substance marked *Gummi rubrum astringens*," which he was told had formerly fetched a very high price. This Dr Royle found to be Butea gum. This is, however, very distinct from the Kino of commerce, which, for many reasons, he was inclined to think was the produce of *Pterocarpus marsupium.*

Dr Pereira states that what he calls *East Indian Kino* is always regarded in commerce as *genuine Gum Kino*, and that an experienced East Indian broker assured him it was the produce of the Malabar coast. He also traced it to Bombay, and to Tellicherry, on that coast. In the official reports of the commerce of Bombay, the Kino exported to this country appears to have been previously imported from the Malabar coast. Dr Royle's attention was again especially turned to this subject on finding in the India House specimens of Kino marked from Anjarakandy, which he recognised as being identical with the present Kino of commerce; but he was unable for some time to ascertain the locality of Anjarakandy, until informed by Mr Dyer that it was the name of a farm within a few miles of Tellicherry—that is, near the very place to which Dr Pereira had traced the East Indian Kino.*

Having thus determined the place, the next point was to ascertain

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* Since then it was discovered that this was formerly one of the East India Company's plantations, under the superintendence of Mr Brown, and was visited by Dr Buchanan, in January 1801 (*Mysore*, ii. p. 544), when, he states, numerous valuable experiments were carrying on in the plantation.

the plant which yielded this kind of Kino, as well as its mode of preparation. This was effected by writing to Dr Wight, stationed at Coimbatore; and though he did not at first succeed, Dr Kennedy afterwards sent him specimens of the flower, leaves, and fruit, also a small portion of the wood and of the gum. On inspecting these, Dr Wight states, "the specimens received along with the letter leave no doubt that the Malabar Kino is the production of *Pterocarpus marsupium.*

Dr Kennedy writes that he is informed by his friend Mr J. Brown of Anjarakandy, that "the juice is extracted when the tree is in blossom, by making longitudinal incisions in the bark round the trunk of the tree, so as to let the gum ooze down into a receiver formed of a broad leaf so placed and fixed in the bark as to prevent the gum from falling on the ground. From the leaf it is made to run into a receptacle placed under the leaf to receive the gum. When this receptacle is filled, it is removed, the gum is dried in the sun until it crumbles, and then filled into wooden boxes for exportation."

Dr Gibson had already stated (see the above *Proc.* p. 59) that "Kino was the produce of *Pterocarpus marsupium* (*beula* or *bia*), a tree very common below the Ghats," also that the Kino was exported in considerable quantities from the Malabar coast. Dr Roxburgh, however, was the first to direct attention to this tree, which he states exudes a red juice, which hardens into a strong, simply astringent, brittle gum-resin, of a dark-red colour, strongly resembling that of the *Butea frondosa;* so that the same analysis might serve for both. He further observes, that the specimen of the gum Kino tree (*P. erinaceus*) in the Banksian herbarium is exceedingly like this plant. The specimens of the Indian and of the African Kino were, as we have seen, the produce of two distinct species of *Pterocarpus.*

P. marsupium, Roxb. (fig. 62.) A lofty tree, with the outer coat of the bark brown, inner red, fibrous and astringent; leaves sub-bifarious, alternate, leaflets 5–7 alternate, elliptic, emarginate, above shining and of a deep green colour, from 3 to 5 inches long; panicles terminal; petals white with a tinge of yellow, long clawed, all waved or crested on the margins; stamens 10, united into one body near the base, but soon splitting into two bodies of five each; ovary generally 2-celled, legume long-stalked, the under three-fourths orbicular, the upper side straight; the whole surrounded with a waved veined membranous wing rugose and woody in the centre, generally 1, sometimes 2-celled; seed solitary, kidney-shaped. Roxb. Corom. Pl. ii. t. 116; Fl. Ind. iii. p. 234. A native of the Circar mountains and forests of the Malabar coast, apparently also of those on the Rajmahl hills, at the foot of the Himalayas.

According to the Rev. F. Mason, a considerable quantity of gum Kino has been exported at intervals from Moulmein in Burmah. It is obtained from certain trees in the Tennasserim provinces, supposed by Mr Mason to be *Pterocarpus Wallichii* and *P. indicus.* Both of these trees are called *Padouk* by the Burmese. (P. J. viii. 387.) But Dr Christison concludes it to be the product of the above *P. marsupium.*

Kino is in small, irregular, somewhat angular, glistening fragments, of a dark-brown or reddish-brown colour, brittle, and affording a powder which is lighter-coloured than the masses. It is without odour, and has a bitterish, highly astringent, and ultimately sweetish taste. When chewed it tinges the saliva blood red. It is not softened by heat; cold water dissolves it partially, boiling water more largely, and the saturated decoction becomes turbid on cooling, and deposits a reddish sediment. Alcohol dissolves the greater portion. It consists chiefly of a peculiar modification of Tannin with Extractive matter, and, in some of the varieties, of a minute proportion of Resin. According to Vauquelin, it contains no Gallic acid, but Tannin and peculiar extractive 75, red Gum 24, insoluble matter 1. Its aqueous sol. is precipitated by Gelatine (with which it produces a green colour, in consequence of the presence of a little *Catechine*), by soluble salts of Iron, Silver, Lead, and Antimony, by the Chloride of Mercury, and by the Sulphuric, Nitric, and Muriatic acids. The alkalies favour its solubility in water, but essentially change its nature, and destroy its astringent property.

Fig. 62.

Soubeiran states that Kino contains more Tannic acid than Indian atechu, but less than Pegu Catechu, and that infusions of Kino and ndian Catechu alike produce a brown colour with Sol. Perchlor. ron, with which the Pegu Catechu forms a green. Herring finds the ed colouring matter of Kino to be acid in its properties. He has amed it *Kinoic acid*. As the fresh juice of the Kino tree is but faintly oloured, it is probable that this red acid is produced by a chemical hange from some other principle.

Action. Uses.—Powerful astringent. Useful in restraining mucous ischarges, &c.

Tinctura Kino, B. Tincture of Kino.

Prep.—B. Macerate powdered *Kino* ℥ij. in *Rectified Spirit* Oj. for seven days, and filter. Add *Rect. Spirit* to make Oj.

Uses and Dose.—Astringent adjunct to Chalk Mixture, &c., in doses of fʒj.–fʒij.

Pulvis Kino Compositus, B. Powder of Kino and Opium.

Prep.—Mix thoroughly *Kino* in powder ℥iij¾, *Opium* in powder ℥¼, *Cinnamon* in powder ℥j. Pass through a fine sieve, and keep in a stoppered bottle.

Uses and Dose.—Astringent and anodyne. Useful in chronic diarrhœa and dysentry in doses of gr. x.–gr. xx. Grs. xx. contain of Opium gr. j.

Pulvis Catechu Comp., B., contains *Kino*, 1 part in 5.

Butea frondosa.—This plant, as mentioned above, yields by incisions made in its bark an astringent gum, which was at one time supposed to be the genuine Kino of commerce. It is no doubt possessed of similar properties, is frequently used as such in India, and useful like it in Diarrhœas and advanced stages of Dysentery. It is also used in the art of tanning. It has been occasionally sent to this country as Kino, and Dr Pereira found it in an old drug-shop marked *Gummi rubrum astringens.* Its Sanscrit name is *Kinsuka.* It is commonly known in India as *Kīni e gond*, and also by the name *Kumrkus.* Its chemical characteristics are very like those of the Kino of Pterocarpus. It is very carelessly collected, and therefore often contains impurities. It is remarkable for containing a beautiful red colouring matter, difficult of separation. Analysed by Mr E. Solly, a portion in the crude state yielded about 50 per cent. of Tannin; but when purified by simple solution in water, so as to separate the impurities, 100 parts contained 73·26 parts of Tannin, 5·05 of difficultly-soluble Extractive, and 21·67 of Gum, with Gallic acid and other soluble substances. The colour and the proportion of Tannin vary with the exposure and season of collection. (*See* Roxburgh, Fl. Ind. iii. p. 245, and Proc. R. Asiatic Soc. May 1838.)

Scoparii Cacumina, B. Sarothamnus Scoparius, *Wimmer.* Tops of the common Broom, fresh and dried. *Diadelph. Decand.* Linn.

The common Broom is supposed by some, and the Spanish Broom by others, to be the σπάρτιον of Dioscorides. The indigenous plant was long known as *Cytisus Scoparius.*

A shrub with angular unarmed branches. Leaves trifoliate, the upper ones simple, stalked, leaflets oblong. Flowers yellow, axillary, solitary, stalked. Calyx bilabiate, the upper lip often entire, the inferior subtridentate. The standard large, ovate. Keel very obtuse, enclosing the stamens and pistils. Stamens all united together. Legume of a dark-brown colour, flat, compressed, hairy at the margins, containing about 15 seeds. Indigenous in sandy and uncultivated places throughout Europe.

Broom tops, like the rest of the plant, have a bitter nauseous taste, and when bruised a peculiar odour. "Straight, angular, dark green, smooth, tough twigs, of a bitter nauseous taste, and peculiar odour when bruised." (B.) Their properties are supposed to depend on the presence of *Cytisine*, and the seeds are the most effective part. The ashes contain about 30 per cent. of Carbonate of Potash and other salts.

Action. Uses.—Emetic and Cathartic in large doses; but used only as a Diuretic in small doses. May be given in dropsies, in powder or in Extract, in doses of gr. x.–gr. xxx., or in decoction.

SUCCUS SCOPARII, B. Juice of Broom.

Prep.—Take of *Fresh Broom Tops* ℔vij., *Rectified Spirit*, a sufficiency. Bruise the Broom Tops in a stone mortar, press out the juice, and to every three measures of juice add one of the Spirit. Set aside for seven days, and filter. Keep it in a cool place.

Dose.—ʒß–ʒj. in Dropsies. A more active agent than the decoction of the dried tops.

DECOCTUM SCOPARII, B. Decoction of Broom.

Prep.—Take of *Broom Tops*, dried, ℥j.; *Distilled Water*, Oj. Boil for ten minutes in a covered vessel, and strain. Pour over contents of strainer enough Dist. water to make up Oj.

Dose.—℥j.–℥ij.

GLYCYRRHIZÆ RADIX, B. Glycyrrhiza glabra, *Linn.* The root, or underground stem, fresh and dried. Liquorice Plant. *Diadelph. Decand.* Linn.

Liquorice, the produce probably of more than one species, was known to the ancients by the name γλυκύῤῥιζα. It was employed by the Arabs, and well known in the East, a produce of Mooltan, &c. It is cultivated in England.

GLYCYRRHIZA, *Linn.* *Diadelph. Decand.*

Calyx, naked, tubular. 5-cleft, bilabiate, with the two upper lips united more than the others. Standard ovate-lanceolate, straight; keel 2-petalous, or 2-parted, straight, acute. Stamens diadelphous. Style filiform. Legume ovate or oblong, compressed, 1-celled, 1–4-seeded.—Perennial, herbaceous plants, of the tribe *Loteæ*, with very sweet roots. Leaves unequally pinnated. Racemes axillary. Flowers blue, violet, or white. Natives of the south of Europe, and some of the northern parts of Asia.

G. GLABRA, *Linn.*—The roots running to a considerable distance. Leaflets about 13, oval, slightly emarginate, viscid underneath, stipules wanting. Racemes axillary, erect, shorter than the leaves. Flowers distant, pale lilac. Legumes compressed, smooth, 3–4-seeded. Native of the south of Europe, Syria, foot of Mount Caucasus, cultivated at Mitcham in Surrey, &c.—St. and Ch. 111, 134. *Liquiritia officinalis*, Nees von E. 327.

G. ECHINATA, *Linn.*—Leaflets oval, lanceolate, mucronate, glabrous; stipules oblong, lanceolate; spikes of flowers capitate, on very short peduncles; legumes oval, mucronate, 2-seeded, echinated by bristles. This is sometimes called Russian Liquorice. It is found in Greece and Southern Russia, extending, it is said, into Tartary and Northern China.—Sim's Bot. Mag. 252; Nees, 328.

Species of Glycyrrhiza no doubt also extend into Affghanistan, whence

Liquorice-root, *Jeeteemudh*, is imported into India. These species may, or may not, be distinct from the preceding.

Most of the Liquorice used is produced by *G. glabra*, which is extensively cultivated at Mitcham. When the plant is about four years old, the roots are dug up with a fork, and arranged in stacks until wanted for the market. The average annual yield is about 1 ton per acre. (P. J. x. 298.)

Liquorice-roots, or rather underground stems, when fresh, are in long-branched pieces, an inch or less in diameter, tough and pliable, roundish, plump, and smooth. They may be preserved thus for some time, if kept in dry sand. When dry, they are wrinkled, of a brown colour externally, yellowish and fibrous internally, with considerable sweetness, still more conspicuous when the root is powdered; in either case it is also a little acrid. Both the fresh and the dry root are officinal. The roots consist of Lignin, Starch, Albumen, Wax, Asparagin, Resinous oil, Colouring matter, Phosphates and Malates of Lime and Magnesia, and a peculiar principle which has been called *Glycion* and *Glycyrrhizin*, or Liquorice Sugar, and upon which depends the sweetness of Liquorice, while its acridity is connected with the Oleo-resin. *Glycion* ($C_{48}H_{36}O_{18}$) is very sweet, of a yellow colour, and transparent, but uncrystallisable. It seems to partake partly of the nature of acids, and partly of that of alkalies. It is soluble both in water and in Alcohol. This principle has been found in a few other sweetish-tasted roots.

Action. Uses.—Demulcent in Catarrhs, Urinary, and Bowel complaints. Useful in sweetening and flavouring medicines. The Powder and Extract are employed in making pills, and the former in covering them.

EXTRACTUM GLYCYRRHIZÆ, B. Extract of Liquorice.

Prep.—B. Take of *Liquoriæ Root*, in coarse powder, ℔j., *Distilled water*, a sufficiency. Macerate the Liquorice Root in f ℥viij. of the water for twelve hours; then pack in a percolator, and add more Distilled water, until the root is exhausted. Heat the liquor to 212°, and strain through flannel; then evaporate by a water bath to a proper consistence. (In the L. P. the fresh root was used.)

When well prepared, this extract is of a brown colour, very sweet, and not at all acrid. Dr Christison remarks that boiling (as ordered by the L. C.) is unnecessary, indeed injurious, cold water and the process by percolation yielding often 40 to 58 per cent. of very fine extract.

COMMERCIAL EXTRACT OF LIQUORICE.—This is commonly known by the names of *Liquorice*, *Extract of Liquorice*, and *Liquorice Juice*. It is prepared in large quantities in the south of Spain, in Italy, and in Sicily, and brought to a proper consistence by evaporating the Decoction in copper vessels. It is then formed into roundish or flattened sticks, of a brownish-black colour, often covered with Bay-leaves. The finest is that marked Solazzi. What is called *Refined* Liquorice, in black, shining, pipe-like cylinders, is a mixture of Liquorice and Gum or Gelatine. It is apt also to be mixed with Flour, Starch, coarse Sugar, and other adulterations. Liquorice is so well known as not to require detailed notice.

Off. Prep.—Infus. Lini, B. [Decoctum Hordei Comp. L.] Dec. Sarsæ Comp. B. Conf. Sennæ, B. Conf. Terebinthinæ, B. Dec. Aloes Comp. B. Tinctura Aloes, B. Troch. Opii, B.

TRAGACANTHA, B. Astragalus verus, *Ollivier*, and possibly other species, B. A gummy exudation from the stem. (From Asia Minor.) Tragacanth.

The τραγάκανθα of Dioscorides was no doubt a plant of the same genus as that which now yields Tragacanth. Sibthorp considers *Astragalus aristatus*, L'Hert., to be the plant. Arab authors describe it by the name *kusera* or *kutira*, for which, in India, *kuteera* is substituted. This is produced both in the North-west and in the Peninsula of India by *Cochlospermum Gossypium*. Tournefort adduced *A. creticus* of Lamarck, a native of Mount Ida in Crete, to be the plant yielding Tragacanth. Labillardière describes his *A. gummifer*, a native of Mount Libanus in Syria, as one of the plants; while Ollivier states his *A. verus*, inhabiting Asia Minor, Armenia, and northern Persia, as yielding the largest quantity of Tragacanth. Dr E. Dickson, physician to the Consulate at Tripoli, when travelling in Koordistan, collected specimens of the plants which he ascertained to yield Tragacanth. These he gave to Mr Brant, British Consul at Erzeroum, by whom they were sent to Dr Lindley, who determined that the white or best variety of Gum Tragacanth is yielded by *Astragalus gummifer*, and the red or inferior kind by his *A. strobiliferus*. Dr Dickson favoured Dr Royle with the following observations:—"Besides the two last-named species, I observed also a third variety that give Gum Tragacanth, which, unfortunately, I lost when my things were robbed at Hassen-kalek. From the Koordish mountains being covered with many species of Astragalus, I should think it not unlikely that other varieties of this genus may hereafter be discovered yielding the Gum."

ASTRAGALUS, *Dec.* *Diadelph. Decand.* Linn.

Calyx 5-toothed. Corolla with an obtuse keel. Stamens diadelphous. Legume 2-celled, or half 2-celled in consequence of the dorsal or lower suture being turned inwards, *Dec.*

Sectio Tragacanthæ.—Petioles permanent, thorn-like. Stipules adhering to the petioles.

A. VERUS, *Olliv.*—Flowers yellow, axillary, in clusters of 2 to 5, sessile. Calyx tomentose, obtusely 5-toothed. Leaflets 8 to 9 pairs, linear hispid. A native of Anatolia, Armenia, and Northern Persia; yields Tragacanth, which is collected from July to September. Used in Persia, exported to Europe, and also to India.—Olliv. Voy. 3. t. 44; Nees von E. 329.

A. GUMMIFER, *Labill.*—Flowers 3 to 5, axillary, sessile. Calyx 5-cleft, together with the legumes woolly. Leaflets 4 to 6 pairs, oblong, linear, smooth. A native of Mount Lebanon, also of Koordistan, where it yields white Tragacanth, but which Labillardière represents as vermicular in form.

A. CRETICUS, *Lam.*—Flowers axillary, sessile, aggregate. Calyx 5-partite with feathery setaceous lobes rather larger than the corolla. Leaflets 5 to 8 pairs, oblong, acute, tomentose. Mount Ida in Crete, where it yields a little Tragacanth.

A. ARISTATUS, *L'Her.*—Peduncles very short, usually 6-flowered; calycine teeth long and setaceous; leaves with 6-9 pairs of oblong, linear, mucronate, pilose leaflets; legumes scarcely half bilocular. A native of the Alps of Europe, also of Greece. Sibthorp stated that this species yielded a gum called τρανοχάνδα in Greece, which was exported to Italy. Landerer has lately ascertained that Tragacanth is yielded by this species on the hills near Patras, and exported to Venice and Trieste, or as Levant Tragacanth to Marseilles and Ancona. (*c.*)

A. Dicksonii, *Royle.* (*A. strobiliferus*, Lindley, not of Royle, Him. Bot. p. 199.)—Flowers capitate in an ovate, sessile, axillary, strobile. Bracts imbricate, pinnated, tomentose. Calyx feathery, 5-cleft. Segments of the corolla equal. Leaflets 3-paired, woolly, oval, awned at the apex, narrow at the base. *Lindley.* As Dr L. inadvertently named this species *A. strobiliferus*, there being already one of that name, Dr Royle has named it after the discoverer of the plant, who also found that it yielded a reddish-coloured Tragacanth.

Tragacanth exudes from the above plants either naturally, or from wounds, and hardens in various forms. It is imported into this country from Smyrna, the Levant, and rarely from Greece.

Mr Maltass has ascertained that most of the Tragacanth of commerce is obtained in Anatolia, especially in the neighbourhood of Caissar, the ancient Cæsarea. The best, or flaky specimens, are obtained by cutting the stems of the plants close to the ground in the month of July. Inferior kinds exude spontaneously. The products thus collected commonly undergo admixture with two other kinds of gum, called *Caramania* and *Moussal* gum. The first comes to Smyrna from the province of the same name; it is supposed to be produced by *A. gummifer.* It is darkish-coloured, and is sometimes fraudulently whitened with Carbonate of Lead. The *Moussul* gum comes from Armenia. It is thought by M. Guibourt to be identical with the *Kutira* of Persia and India, the product of species of *Cochlospermum* and *Sterculia.*

Tragacanth is found in commerce either of a white or a reddish-yellow colour, in broad thin flakes, or in tortuous vermicular pieces; the former is the best, and most common here. It is white or greyish, semi-transparent, tough, horn-like, and tasteless, and being a little elastic, is with difficulty reduced to powder, unless heated to 120°. In contact with cold water, it absorbs a certain portion, swells, and becomes adhesive and diffused. It does not dissolve except in boiling water, when some change is supposed to take place, a great portion afterwards separating again. It is insoluble in Alcohol. Tragacanth appears to consist of two distinct gummy principles. Bucholz and Guerin Varry found of common Gum or Arabin from 53 to 57 per cent., and of Bassorin 33 to 43 parts, with water and a little Starch, the presence of the latter producing a blue colour with Iodine. The *Arabin* rather resembles than is identical with that of Gum Arabic, for, as first pointed out by Dr Duncan, its mucilage is not precipitated by Silicate of Potash. The *Bassorin* is like that found in Gum Bussorah, and other imperfectly soluble gums. It is sometimes called *Tragacanthine*, is solid, colourless, without odour or taste, insoluble in water, but absorbing it and swelling up. Nit′ converts it into Oxalic′ and into Mucic acid. Sul′ changes it to a saccharine substance, which is not susceptible of Alcoholic fermentation. Guibourt, however, considers Tragacanth to consist of a peculiar Mucilaginous principle, with a little Starch and Ligneous fibre.

Action. Uses.—Demulcent. Useful, from its viscidity, to hold insoluble matters in suspension in water.

Mucilago Tragacanthæ, B. Mucilage of Tragacanth.

Prep.—To *Dist. water* ℥x., contained in a pint bottle, add *Tragacanth*, in powder, gr. lx.; agitate briskly for a few minutes, and again at short intervals, until the Tragacanth is perfectly diffused, and finally has formed a mucilage. (Previously made with boiling water.)

Action. Uses.—Demulcent. Used also in making pills and suspending heavy powders.

Pulvis Tragacanthæ Compositus, B. Compound Powder of Tragacanth.

Prep.—B. Rub well together *Starch* ℥j. and *Refined Sugar*, in powder, ℥iij.; powdered *Tragacanth*, ℥j., and powdered *Gum Arabic*, ℥j.

Action. Uses.—Demulcent in doses of gr. xxx.–gr. lx. Used also as a vehicle for other medicines. A Syrup may be made with *Tragacanth* gr. lx. to *Syrup* Oij., which is much commended.

[Mucuna, L. Mucuna pruriens, *Dec.* Fructûs Pubes. Hairs from the Pod. Cowhage or Cowitch. *Diadelph. Decand.* Linn.

The strigose hairs of the plant called *kiwach* in India, as well as those of *Rottlera tinctoria*, are used as Anthelmintic in India, whence the practice was probably introduced, as well as the corrupted name. Sir W. Hooker has distinguished the East Indian Plant *M. prurita* from *M. pruriens*, which is indigenous in the West Indies.

Mucuna, *Adans.* (*Stizolobium*, Willd.) *Diadelph. Decand.* Linn.

Calyx with 2 long caducous bracteoles, campanulate, 2-lipped, upper lip entire, lower trifid. Vexillum shorter than the wings and keel. Keel terminated by a polished acute beak. Stamens diadelphous, alternately longer. Legume hispid, oblong, few-seeded, with partitions of cellular substance between the seeds. Seeds oval, roundish or reniform, with a narrow oblong line. the hilum. Twining plants of the tribe Phaseoleæ. Leaves trifoliolate; leaflets hairy on the under surface. Racemes axillary, with large purplish, white, or yellow flowers.

M. pruriens, *Dec.*—Leaflets ovate, acute, the middle one rather rhomboidal, the latter ones oblique at the base. Racemes lax, many-flowered, interrupted, 1–1½ foot long. Flowers with a disagreeable alliaceous odour, standard flesh-coloured, wings purple or violet, keel greenish-white. Calyx hairy, pink, with lanceolate segments. Legume about 3 inches long and roundish, as thick as the finger, with somewhat keeled valves, densely covered with strong and stiff, sharp-pointed brown hairs. Native of the West Indies.—Bot. Reg. 1838, t. 18; Steph. and Churchill, iii. t. 179.

M. prurita, *Hook.*—Leaflets smaller, more obtuse, the middle one truly rhomboidal, the lateral ones dilated on the upper edge. Raceme ovate, compact, more often 3-flowered. Flowers dark purple. Calyx with short triangular teeth. Legumes oblong, much broader, curved and compressed, without any raised keel on the back of the valves, densely covered with sharp stringy hairs; which, white and soft when young, become brown and stiff when ripe. Native of the East Indies.—Hooker, Bot. Misc. ii. 348; Suppl. t. 13.

The pods of the Kiwach, when young and tender, form articles of diet in India. When ripe, they are of a brownish colour, and covered with innumerable sharp, prickle-like hairs, which penetrate into and irritate the skin.

Action. Uses.—Mechanical Anthelmintic. Useful in expelling lumbrici and ascarides, by sticking into their bodies, when pressed against the intestinal parietes, and thus irritating and dislodging them.

Dose.—The pods being dipped into treacle or honey, have the hairs scraped off until the mass has the consistency of an electuary, of which a table-spoonful may be given to adults, or a tea-spoonful to children, and followed by a purgative of Castor oil, &c.]

PHYSOSTIGMATIS FABA, B. Physostigma venenosum, *Balfour.* The seed. *Calabar Bean.* (From Western Africa.)

The *Physostigma venenosum*, a leguminous plant of the sub-order *Papilionaceæ*, produces the *ordeal bean* of Calabar. Nine years ago, Dr Christison described a large leguminous seed which was used in the ordeal by poison by the natives of Old Calabar in the Gulf of Guinea, where it is called *Eséré.* He found that its active properties were contained in the alcoholic extract, which amounted to 2·7 per cent. of the bean. In 1859, specimens of the plant were forwarded

Fig. 63.

by Mr Thomson from the African coast to Professor Balfour of Edinburgh, who described and examined it. The genus, closely allied to *Phaseolus*, is named from its stigma, which is crescent-shaped, with a hooded appendage.

PHYSOSTIGMA VENENOSUM, *Balfour*.—A large twining plant, subshrubby; root fibrous, often with small tubers. Stem 2 inches in diameter at its thickest part, often 50 feet long, cylindrical. Branches twisting on themselves, and round others. Wood very porous, with astringent and acrid juice. Woody bundles arranged in wedges. Leaves alternate, stalked, stipulate, pinnately trifoliate. Leaflets ovate, acuminate, stipulate, lateral ones oblique at base. Flowers on axillary racemes. Rachis zigzag, with knots from which the flowers spring. Flowers articulated to pedicels, 1 inch long. Calyx campanulate, 4-cleft, upper division notched. Corolla papilionaceous, of a beautiful pink colour with a purplish tinge, curved in a crescentic manner. Vexillum large, covering rest of flower in æstivation, bilobate at apex, which is completely recurved. Alæ large, deeper coloured. Keel as broad, and longer than alæ, curved upwards into nearly ¾ of a circle. Stamens 10—9 united, 1 free. Pistil 1½ inch long. Style curved, with a line of hairs on its concave side. Stigma with a remarkable sac or hood extending over style. Legume when young green and curved, when ripe brown and straight, with curved apex, 7 inches long, stalked, dehiscent. Seeds 2 or 3, 1 inch long, ¾ inch broad. Hab. Old Calabar.

The pods contain 2–3 seeds. The seed is oblong or reniform, 1–1½ inch long, and ¾ inch broad, the convex edge marked by a long furrowed hilum, rough externally with some polish, weighing when dry about 60 gr. The two cotyledons are hard and white, easily pulverised, without peculiar odour or taste. Separate from the husk they weigh about 46 gr. They contain a peculiar poisonous alkaloid called *Physostigmine*.

Calabar Bean is a powerful sedative poison, producing paralysis and death, but is of use to ophthalmic surgeons for possessing the power of contracting the pupil when applied to the eye. Its operation is as certain as that of Belladonna, and its effect is just the reverse. It counteracts presbyopia produced by dilated pupil. It was introduced in the B. P. of 1867.

EXTRACTUM PHYSOSTIGMATIS, B. Extract of Calabar Bean.

Prep.—Take of *Calabar Bean*, in coarse powder, ℔j.; *Rectified Spirit*, Oiv. Macerate the Bean for forty-eight hours with one pint of the Spirit in a close vessel, agitating occasionally, then transfer to a percolator, and when the fluid ceases to pass, add the remainder of the Spirit so that it may slowly percolate through the powder. Subject the residue of the bean to pressure, adding the pressed liquid to the product of the percolation; filter, distil off most of the Spirit, and evaporate what is left in the retort by a water bath to the consistence of a soft extract.

(Introduced in 1867).

Dose.—Gr. $\frac{1}{16}$ to gr. ¼. It is, however, chiefly employed for external use. Rubbed on to the temple it will produce contraction of the pupil of the eye. The above quantity being dissolved in Oß of water, each minim will represent about 2 gr. of the bean. One drop of the solution may be introduced between the eyelids, or minute squares of paper or gelatine impregnated with it may be used in the same manner as with Atropia (q. v.)

The *Baptisia tinctoria*, or Wild Indigo of the Northern States, a plant of the papilionaceous tribe, is used to obtain a blue dye, and employed in medicine by the American practitioners called

"Eclectics." A resinous extract of the root, called *Baptisin*, is made by preparing a tincture with strong alcohol, and precipitating this with water. It is given in doses of 1–2 grains. It is stimulant in small, nauseant and emetic in large doses. It is reported to be of use in dysentery, putrid fevers, and gangrenous inflammations, as an "antiseptic." Further experiment is needed to determine its real value.

The Leguminous order produces many substances which are useful as food, or employed in the arts. Of these latter, one which is used in pharmacy as a test, though not officinal for other purposes, requires mention here.

Indigo, (B. Appendix) the *ἰνδικόν* of Dioscorides, *indicum* of Pliny, is a well-known blue dye, which is yielded by several plants. In India it is produced by *Indigofera tinctoria* and *Wrightia tinctoria*. In Nubia it is said to be obtained from *Tephrosia Apollinea;* and from *T. toxicaria* on the banks of the Niger. But most of that in commerce is produced by *Indigofera tinctoria*, which is cultivated extensively in Bengal, Tirhoot, and in other parts of India, seeds being supplied from the North-west provinces. The plants are cut down when young, before flowering, and steeped in vats of water. During this maceration their juices undergo a kind of fermentation, by which the blue indigo is produced. Oxygen is absorbed, and Carbonic acid evolved. The plants being kept for 7-15 hours at a heat of 85° Fahr., and held below the surface by timbers placed above them, bubbles of gas rise to the surface of the liquid. At first these consist of 8 per cent. Carb. acid gas, and the rest Atmospheric air containing about ¼ less than the usual proportion of Oxygen. Towards the end of the disengagement, the Carb. acid has been found to rise to 40·5, the Oxygen being 4·5, Nitrogen 55, in 100 parts. But when the external air has been rigorously excluded, as much as 86 per cent. of the Carb. acid has been found. When this fermentation has proceeded far enough, which is ascertained by the appearance of a greenish tint on the surface of the yellow liquor, it is withdrawn into lower vats. Here it is submitted to beating and agitation for about 2 hours, and, fresh surfaces being exposed to the contact of the air, more Carb. acid is disengaged and Oxygen absorbed, and the Indigo coagulates in large grains. When this formation does not take place rapidly enough, some precipitant, as Lime water, is added. The Indigo is lastly collected, cut while soft into cubical cakes, and dried in a drying-room

Indigo is of an intense blue colour; assumes a coppery tint when scratched or rubbed; is insoluble in water, alcohol, ether, oils, and dilute acids and alkalies. It has yielded on analysis 79·50 of pure Indigo-blue (*Indigotin*), Oxide of Iron 5·75, Alumina 0·75, Lime 0·90, Green veg. matter 8·80, Red resinous do. 2·0, and loss 2·3, in 100 parts. Deoxidising agents destroy its colour and form *white indigo*, which, when exposed to the air, absorbs oxygen, and becomes blue. This white indigo is soluble in water, and is therefore very useful in dyeing, as it turns on exposure to an insoluble blue colour. Pure blue Indigo is soluble in 15 parts of strong Sulphuric acid, forming a deep blue solution, which is soluble in water, and also is used in the arts. Commercial Indigo consists, as above, of *Indigotin*, or pure indigo-blue, along with many impurities. *Indigotin* has the formula $C_{16}\,H_5\,NO_2$. White Indigo contains one atom more of Hydrogen. Under the influence of oxidising agents, the insoluble *Indigotin* produces *Isatin*, a yellow crystalline compound, which is soluble in water and alcohol ($C_{16}\,H_5\,N\,O_4$). When boiled with a strong solution of Potash, Indigotin undergoes a curious and complex series of changes.

The sulphuric solution of Indigo contains a peculiar compound called *Sulphindylic acid* ($C_{16}\,H_5\,N\,O_2 + 2\,S\,O_3$). This is contained in the appendix of the B. P. under the form of Liquor Indigo Sulphatis, made with 5 gr. of *Indigo*, and ℥x. *Sulph. acid.* Its colour is destroyed by free Chlorine, and it is thus a delicate test for the presence of this gas in an uncombined state. It is used for this purpose as a test for *Hydrochloric acid* and *Liquor Sodæ Chloratæ.* The indication should be negative in the former and positive in the latter case.

ROSACEÆ, *Endlicher.* Roseworts.

The ROSACEÆ, *Dec.*, like the Leguminosæ, are divided into several groups, which by most botanists are treated of as distinct orders. Among these, the Amygdaleæ, true Roseæ, and Pomaceæ, contain officinal species. They may all be distinguished from Leguminosæ by the odd division of the calyx being anterior.

The Rosaceæ are found in the temperate and cold parts of the northern hemisphere; a few only occur in the plains of tropical countries. An astringent principle is found in most parts of many of the species; a highly fragrant volatile Oil is also secreted by the Roses, &c. In others, the carpels being berried, or the receptacles fleshy, a highly grateful fruit is afforded.

[TORMENTILLA, L. Potentilla Tormentilla. Rhizoma. Common Tormentil. *Icosand. Polygyn.* Linn.

Tormentil has long been employed. Some suppose it was known to the Greeks.

Root large, perennial, irregularly shaped. Stems slender, spreading, often procumbent or straggling. Leaves sessile or shortly stalked, ternate, the lower leaves quinate on long petioles; leaflets oblong, acute, deeply serrated, a little hairy; stipules smaller, deeply cut. Flowers yellow. Calyx concave, usually 8-parted, in two rows, the exterior smaller. Petals 4, sometimes 5. Stamens numerous. Style lateral. Fruit consisting of numerous small nuts collected upon the flattish dry receptacle; in this species these nuts are longitudinally wrinkled. Seeds suspended.—Common on heaths and meadows throughout Europe.—E. B. t. 863; St. and Ch. i. t. 26.

The rhizome, or rootstock, is tuberous and knotty, with numerous radicles, of a dark-brown colour on the outside, and reddish internally, with little smell, but having a strong astringent taste. It contains about 17 per cent. of Tannin, with colouring matter, Gum, and a little Volatile Oil. It is employed in tanning in the north.

Action. Uses.—Astringent. Useful in Diarrhœa or Chronic Dysentery, in doses of gr. xxx.–gr. lx.

DECOCTUM TORMENTILLÆ, L. Decoction of Tormentil.

Prep.—Boil *Tormentil* bruised ℥ij. in *Aq. dest.* Ojß down to one pint, and strain.

Action. Uses.—Astringent in doses of f℥jß, 2 or 3 times a-day; or used as an astringent lotion.]

ROSA, *Tourn.* Rose. *Icosandria Polygynia*, Linn.

Calyx urceolate, contracted at the mouth, ultimately succulent; limb 5-cut. Segments imbricated, often pinnately divided. Petals 5, obcordate, deciduous. Stamens numerous, inserted with the petals into the rim of the calycine tube. Carpels numerous, inserted into and enclosed within the fleshy tube of the calyx, each thickly covered with hairs, and having a lateral style on the inner side; styles all passing through the contracted mouth of the calyx. Fruit globular or ovate, formed of the above fleshy and coloured tube of the calyx enlarged, enclosing within it numerous hard and bristly little nuts with inverted seeds.—Shrubs, often scandent, leaves usually impari-pinnate, leaflets serrated; stipules attached to the sides of the petiole.

Some species of Rose, being indigenous in Greece, were no doubt known to the Greeks, and *R. canina* is supposed to be their κυνόροδον. But the Hundred-leaved and the Damask Rose, natives of the East, and cultivated there, were also known and highly esteemed. The term ῥόδον seems to have been also applied to the Oleander, or Rose-Bay, called at one time Rhododendron. Three species of Rose are officinal.

Rosa canina, *Linn.* Fructus, B. Dog Rose. The ripe fruit. (Indigenous.) Hips.

Common in hedge-rows, &c., in Europe; is supposed to have been the κυνόροδον of the Greeks.

This is a variable species, and several of its varieties have obtained distinct names. Shoots assurgent with uniform hooked prickles, and chiefly without setæ. The leaves are without glands, naked, or slightly hairy, the serratures simple or compound. Flowers of a rose-red colour. Sepals pinnate, deciduous. Styles remaining distinct.—E. B. 992; St. and Ch. 11, 100.

The fruit, or rather the inferior part of the calyx, becomes succulent, is of an ovoid form, of a scarlet or crimson colour, and contains within its hollow the true fruit or woolly carpels, which require to be carefully removed, as their setæ are very irritant. The pulpy part has a sweetish acidulous taste. When dried, it yielded to Bilz 25 per cent. of Gum, 30·6 of uncrystallisable Sugar, of Citric′ 2·95, of Malic′ 7·77, with several Salts, a little Tannin, and Volatile Oil.

Confectio Rosæ Caninæ, B. Conserve of Dog Rose fruits.

Prep.—B. Beat *Hips*, deprived of their seeds, ℔j. to a pulp in a stone mortar, rub the pulp through a sieve, add *Refined Sugar* ℔ij., and rub well together.

Action. Uses.—Acidulous, Refrigerant. Chiefly valuable as a vehicle for other medicines, as in Pil. Quiniæ.

Rosa gallica, *Linn.* Petala, B. The Red (or French) Rose. Unexpanded petals, fresh and dried. (Cultivated in Britain.)

The Red, or French, called also the German and Austrian Rose, is a native of the middle and south of Europe, and may have been known to the ancients. Dr Christison states that the true Red Rose of pharmacy is a variety, considered by some a distinct species, and called *Rosa provincialis*, having been probably introduced into Europe by the Crusaders, from its native country, Barbary. It is cultivated at Mitcham.

A dwarfish, stiff, short-branched bush, with the shoots armed with nearly equal uniform prickles and glandular bristles intermixed. Leaflets stiff, elliptical, rugose. Flowers several together, large, erect, with leafy bracts. Sepals ovate, leafy, compound. Fruit oblong.—Nees von. E. 303; St. and Ch. iii. 99.

The petals alone are officinal; they look velvety, are of a purplish-red colour, with whitish down; have little scent when fresh, but this becomes developed as they dry. The half-blown buds are ordered by the B. P.; from these the calyxes and claws being cut off, they are quickly dried and sifted to get rid of impurities. They should be kept in well-closed vessels, and in the dark. In this state they have a rose-like odour, will long retain their colour, and have a slightly bitter, astringent taste. Analysed, they have been found to contain a little Tannin, Gallic acid, Colouring matter, a little Volatile Oil, with other vegetable matters and some Salts, and a trace of Oxide of Iron. The Infusion strikes a black colour with ferruginous salts.

INFUSUM ROSÆ ACIDUM, B. Infusion of Roses.

Prep.—B. Add *Dil. Sulphuric acid*, ʒj. to *boiling Dist. water*, ℥x. Infuse *dried Red-rose petals*, broken up, ℥¼ in the mixture in a covered vessel for half-an-hour, and strain.

Action. Uses.—Slightly Astringent and Tonic. The colour imparted to water is heightened by the acid. A much-approved vehicle for saline purgatives, Quinine, &c. The presence of Sulphuric′ must never be forgotten in prescribing it.

Dose.—f℥jß every 3 hours. Makes a good gargle with acids, or Alum and Honey.

CONFECTIO ROSÆ GALLICÆ, B. Conserve of Red Roses.

Prep.—Beat to a pulp in a stone mortar *Fresh Red-rose petals*, ℔j., add *Refined Sugar*, ℔iij., and rub well together.

Action. Uses.—Slightly astringent in doses of gr. lx.–gr. cxx., but chiefly useful in making pills.

[MEL ROSÆ, L. Honey of Roses.

Prep.—L. Macerate *dried Red-rose petals*, ℥iv., first separated, in *boiling Dist. water*, f℥xvj. for two hours, then press them lightly with the hand, and strain. Macerate what remains again for a short time in *boiling Dist. water*, f℥viij., and pour off the liquor. Add to this half of the first infusion, and set aside the rest. Add then the mixed liquids to *Honey*, ℔v., and evaporate in a water bath until, when the rest of the liquid is added, it may become of a proper consistence.

Action. Uses.—Mild Astringent; and being pleasant-tasted, is applied to Aphthæ, and used as a vehicle in gargles.]

SYRUPUS ROSÆ GALLICÆ, B. Syrup of the Red Rose.

Prep.—B. Infuse dried *Red-rose petals*, ℥ij. in *boiling Dist. water*, Oj. for two hours, squeeze through calico, heat the liquor to the boiling point, and filter. Dissolve *Refined Sugar* ℥xxx. in the mixture by means of heat. The product should weigh ℔ij. ℥xiv., and have the Sp. Gr. 1·335.

Action. Uses.—Slightly astringent; but chiefly used for colouring and flavouring medicines.

ROSA CENTIFOLIA, *Linn.* Petala, B. The Hundred-leaved or Cabbage Rose. The fresh petals, fully expanded. (Cultivated in Britain.)

This Rose has long been cultivated in Europe, having been introduced from the East. It is said to be indigenous in the Eastern Caucasus. The Persians also have a *sud-burg* (or hundred-leaved Rose), and the ancients were acquainted with one having many petals. Of the above species there are many varieties.

A bush with erect shoots, which are rather thickly covered with nearly straight prickles, scarcely dilated at the base, intermixed with glandular bristles, all of different forms and sizes, the large ones falcate. Leaflets 5 to 7, oblong or ovate, glandular at the margin. Flowers several together, drooping. Buds short, ovate, with leafy bracts. Sepals in flowering, spreading not deflexed, leafy, more or less pinnate, and with the peduncles glandulously viscid. Fruit ovate.—Cultivated at Mitcham, &c.—Nees von E. 302; St. and Ch. iii. 99.

The petals of this species are well known for their fragrance; on which account, as well as for the beauty of the flowers, they are extensively cultivated, and consequently numerous varieties have been produced; so that it is difficult to say which is a species and which only a variety. In many parts of India, *Rosa damascena*, or Damask Rose, is cultivated for the purpose of yielding the *Attar* of Roses, as well as Rose water. As the species of Rose are but few in India, perhaps the same may be cultivated in the extensive Rose Gardens of Ghazipore, which is the great mart for Attar in India. The petals should be collected just when fully blown, and if quickly dried, will long retain much of their fragrance, especially if preserved with salt. Besides the Volatile Oil, these petals contain a slightly laxative principle, with some of the same constituents as the other Roses.

AQUA ROSÆ, B. Rose Water.

Prep.—B. Mix *fresh petals of Rosa centifolia*, ℔x., or an equivalent quantity of the petals which have been preserved while fresh with common salt, with *Water*, Cij. Distil Cj. (*Essential Oil of Roses*, ♏xx., may be shaken with *Aq. dest.* Cß, and filtered.)

Action. Uses.—An agreeable vehicle for lotions and for active medicines.

OLEUM ROSÆ. Volatile Oil or Attar of Roses.

This is imported from India and the Levant. It is well known for its delightful fragrance. 100,000 roses distilled with water yield only about 180 grains of Attar. It varies in colour, and becomes solid below 80° F. Sp. Gr. 0·832 at 90° F. Soluble in Alcohol, and a little taken up by water, as in Aqua Rosæ. It consists of two principles, one being a *solid*, the other a *liquid volatile oil*. The former is scarcely soluble in Alcohol. In distilling Rose water in this country, some of the crystalline Volatile Oil is sometimes obtained. As it is added by the perfumers to many scents, so it may be employed in imparting an agreeable odour to ointments and lotions.

CUSSO, B. Kousso. Brayera anthelmintica, *Dec.* The flowers and tops. (Collected in Abyssinia.)

This drug, which has been lately employed with considerable success as an Anthelmintic, consists of the flowers of the *Brayera anthelmintica*, Kunth, a Rosaceous plant which grows in Northern Abyssinia, and belongs to the tribe Dryadeæ of De Candolle. The flowers are apetalous and diœcious: they were first imported in the dried state into France by M. Rocher d'Héricourt, and are used both in that country and in England for the purpose of expelling Tapeworm, for which they were first employed by the native Abyssinians. Kousso was described at length by Dr Pereira, in the Pharm. Journal, vol. x. 15. Mr Savory obtained a supply of the drug from Aden. Some Kousso forwarded to Dr Budd from this port, and contained in a goat-skin bag, was examined by Dr Headland, and found to consist of the flowers and flower-stalks of the same plant as that imported by M. d'Héricourt from Africa.

Brayera anthelmintica, *Dec.*—A tree 20 feet high. Branches round, rusty, tomentose-villose, marked by annular cicatrices of the fallen leaves. Leaves

Fig. 64.

crowded, alternate, interruptedly impari-pinnate, and sheathing at the base. Leaflets oblong or elliptical-lanceolate acute, serrate, villose at the margin and on the nerves of the under surface. Stipules adnate to the petiole, which is dilated at the base, and amplexicaul. Flowers diœcious, small, greenish, and becoming purple, repeatedly dichotomous, the pedicels with an ovate bract at the base. Outer segments of the calyx in the female fl. 4 or 5 times as large as those of the inner row, petals wanting, stamens rudimentary. The so-called male flowers contain developed carpels. *Hab.* Abyssinia. Beke found it growing luxuriantly near the source of the Abai, or Bruce's Nile. Bruce described the tree, and figured it correctly.

The dried male and female flowers, mixed together, and brownish in colour, with the hairy stalks, are imported in boxes and skins. They have a balsamic odour and bitter taste. They contain a bitter acid resin, a volatile oil, a crystalline principle called *Kwoseine* by Martin, and nearly 25 per cent. of Tannin, slightly modified. The anthelmintic property may lie in the combination of these principles.

Action. Uses.—It kills and brings away tapeworm. The mode of administration of Kousso, which is most recommended, is peculiar. About ½ an ounce is infused in a glass of warm water, and taken thus, flowers and water together, on an empty stomach. The dose may be followed up by a mild purge, as a dose of Castor Oil.

INFUSUM CUSSO, B. Infusion of Kousso.

Prep.—Infuse *Kousso*, in coarse powder, ℥ß, in *boiling Dist. water* ℥viij., in a covered vessel for 15 minutes without straining.

Half or the whole to be taken for a dose. It is but a slight improvement on the method mentioned above. The muddy and bulky draught, though likely to disgust the patient, often succeeds in bringing away the worm, if assisted by Castor Oil.

Various other vegetable products are employed as Anthelmintics in Abyssinia, especially the bark of the *Musenna* tree, used in Gondar, and said to be there esteemed above the Kousso.

POMACEÆ, *Juss.* Apple-worts.

This order is considered by some as a tribe of Rosaceæ. They mostly inhabit the North Temperate Zone and the great mountainous range of India. They are chiefly remarkable for their edible fruit when cultivated, abounding in saccharine matter with a pleasant acidity. In a wild state they are austere or astringent and acid. By distillation of the seeds of some of the Pomaceæ a very little Hydrocyanic acid is obtained.

[CYDONIUM, L. Cydonia vulgaris, *Pers.* Semen. Seeds of common Quince. (*Pyrus Cydonia*, Linn.) *Icosandria Pentagynia*, Linn.

The Quince (*κυδονία*) was known to the ancients and Arabs; the seeds (*bihee dana*) are employed medicinally in India, being imported from Caubul and Cashmere, where the tree is cultivated.

A moderately-sized, much-branched, but crooked tree. Leaves ovate, obtuse at the base, quite entire, with their lower surface, as well as the calyxes and pedicles tomentose. Flowers few, of a white or rose colour, in a kind of umbel. The pomes closed, globose or oblong, 5-celled; *cells many-seeded*, cartilaginous. Seeds enveloped in condensed mucilage.—Nees von E. 305; St. and Ch. ii. 114.

The fruit of the Quince is of a yellow colour, downy, and remarkable for its fine odour. The ancients used it as a medicine, but it is now chiefly employed for flavouring other fruits, or as a preserve. It contains some astringent matter, with Malic acid, Sugar, and azotised matter. (*Soubeiran.*) The seeds are oblong, pointed, convex on the outside, and with one or two flat sides, according to the pressure of neighbouring seeds. Their testa, or thick seed-coat, is covered with condensed mucilage, which, according to Bischoff, as quoted by

Dr Pereira, is lodged in very fine cells, and becomes easily dissolved out when submitted to the action of boiling water.

DECOCTUM CYDONIÆ, L. Decoction of Quince Seeds.

Prep.—Boil with a gentle heat for 10 minutes *Quince Seeds* ʒij. in *Aq. dest.* Oj. Strain.

Action. Uses.—Demulcent. Chiefly applied externally. It is analogous to the Mucilage of Linseed, or Linseed Tea, being viscid and insipid. It has been proposed to evaporate it to dryness, and powder the residue, which will readily afford mucilage with water.

Dr Pereira considers *Quince Mucilage* as a peculiar substance, and calls it *Cydonin.*]

AMYGDALEÆ, *Juss.* Almond-worts. *Icosandria Monogynia*, Linn.

This order, like the last, is often included amongst the Rosaceæ. The Amygdaleæ are found wild in the mountainous parts of the North Temperate zone, but are now cultivated in most parts of the world with moderate climates. The fruit of many is edible; the kernels abound in oil; many exude gum; and some are remarkable for secreting Hydrocyanic acid.

AMYGDALUS COMMUNIS, *Linn.* *Var.* α. Amygd. dulcis. Sweet Almond. *Var.* β. Amygd. amara. Bitter Almond.

The Almond is mentioned in the Bible. Both varieties are found in the countries from Syria to Affghanistan. Both were known to the ancients and to the Arabs. The sweet Almond only was officinal in the B. P. 1864. The Bitter Almond is so also, in 1867.

A small tree with lanceolate leaves, which are glandularly serrate, young leaves folded flat; petioles glandular, equal in length to, or larger than, the transverse diameter of the leaf. Flowers nearly sessile, solitary, appearing earlier than the leaves. Tube of the calyx campanulate. Fruit a dry drupe, ovoid compressed, externally tomentose, when ripe bursting irregularly. Within this is contained a hard but brittle shell, within which is enclosed a kernel, well known as the Almond.—St. and Ch. i. t. 43. Nees, 312, 313.

Though a few botanists have considered the Sweet and Bitter Almonds to be distinct species, the generality describe them as varieties of one species. Nees von Esenbeck indeed states that both are sometimes obtained from the same tree. De Candolle enumerates several varieties, such as may be observed in all cultivated plants.

Var. *α. dulcis.* The Sweet Almond has ash-green leaves, with the glands on the base of the leaf and lower serratures. The style much longer than the stamens. Shell hard; but some sweet almonds have very fragile shells, and are called *kaghuzee*, that is, *papery*, in the East.

Var. *β. amara.*—The Bitter Almond has the petioles of the leaves studded with glands, the style equal in length to the stamens, and the shell hard or brittle.

AMYGDALA DULCIS, B. The seeds of the Sweet Almond. Jordan Almonds.

Sweet Almonds are sometimes sold with the brittle shells on them, and are then called *Shell Almonds.* Almonds are imported into this country from the south of Spain and of Italy. They are mostly cultivated about Malaga. They are known by the names of Jordan, Valentia, and Italian Almonds. They are introduced into India from

Persia and Affghanistan. The Almond is ovoid, being rounded at one end and pointed at the other; flattened; of a cinnamon-colour, from the tough testa with which the kernel is enveloped. When blanched, they are found to be composed almost entirely of two large and conspicuous cotyledons, white in colour, without smell, and of a mild agreeable taste. When old or worm-eaten, they have an unpleasant or rancid taste. Analysed by Boullay, they were found to contain 54 per cent. of a bland Fixed Oil, 24 of *Emulsine*, 6 of liquid Sugar, 3 of Gum, Water 3·5, Lignin 4·0, and Acetic' 0·5; the seed-coats, 5 per cent., contain a little Tannin. The *Emulsine* has also been called *Synaptase*, and the Vegetable Albumen of Almonds. It is white, and owing to its presence the Oil becomes suspended in water in *Almond Emulsion*. When the Oil has been expressed, we have, as in the case of Linseed, a *cake* left, which, being dried and powdered, is known under the name of Almond Powder. Jordan Almonds are not bitter, and "do not evolve the odour of bitter Almonds when bruised with water." (B.)

Action. Uses.—Dietetical, Demulcent, and Emollient.

Pulvis Amygdalæ Compositus, B. Confectio Amygdalæ, L. Compound Almond Powder, or Confection.

Prep.—B. Take of *Jordan Almonds*, ℥viij.; *Refined Sugar*, in powder, ℥iv.; *Gum Arabic*, in powder, ℥j. Steep the Almonds in cold water until their skins can be easily removed; and, when blanched, dry them thoroughly with a soft cloth, and rub them lightly in a mortar to a smooth consistence. Mix the Gum and the Sugar; and, adding them to the pulp gradually, rub the whole to a coarse powder. Keep it in a lightly-covered jar.

Mixed with enough water to form a paste, it forms a confection useful for a vehicle. It is also employed to make the following:—

Mistura Amygdalæ, B. Almond Emulsion or Milk.

Prep.—B. Take of *Compound Powder of Almonds*, ℥ijß; *Distilled water*, Oj. Rub the powder with a little of the Water into a thin paste, then add the remainder of the Water, and strain through muslin.

Dr Pereira recommends *Sweet Almonds*, ʒiv.; powdered *Gum Arabic*, ʒj.; *White Sugar*, ʒij.; *Water*, f℥vjß. Blanch the Almonds, beat them with the Sugar and Gum, the Water being gradually added.

Action. Uses.—Demulcent and Emollient, or as a vehicle for other medicines.

Oleum Amygdalæ, B. Expressed Oil of the seeds of either the Sweet or Bitter Almond. (Prepared in England.)

A bland Oil, apt to become rancid, of a pale-yellow colour, very liquid, Sp. Gr. 0·917–0·920; consisting of Margarine 24, Elaine 76 parts in 100.

Action. Uses.—Laxative and Emollient, like Olive and other fixed Oils. Used to make Unguentum simplex and Ung. Cetacei, Ung. Hyd. Oxidi Rubie, and Ung. Plumb. Subacet. Comp.

Amygdala Amara, B. The seed of the Bitter Almond.

Bitter Almonds are usually found shelled. They are smaller, and commonly imported from Mogadore. Like the Sweet Almond, they are without smell, but have a strong and peculiar bitter taste. Like them also, they contain bland fixed Oil, with *Emulsine*, and readily form a white emulsion with water. They also contain a small portion of an albuminous but very peculiar principle, called *Amygdaline*, soluble in water and in boiling Alcohol, colourless, and crystallisable; this contains Nitrogen, and has a pure bitter taste, but no smell ($C_{40}\ H_{27}\ N\ O_{22}$). It should be remarked that neither volatile Oil nor Hydrocyanic acid is mentioned as a constituent of Bitter Almonds. Indeed, both have been proved by chemists not to exist in them, though they may easily be obtained from them. This is by the mutual action, with the assistance of water, of one principle, Emulsine, when in solution, upon another, the Amygdaline; the one being supposed to bear the same relation to the other that Diastase does to Starch, or acting as Yeast does upon Sugar. The result, made immediately evident by the smell, is the production of the Oil of Bitter Almonds, which is a true Essential Oil, and of Hydrocyanic acid.

Action. Uses.—Sedative, Poisonous. Bitter Almonds, even in small doses, disagree with many, producing derangement of the digestive functions, and a kind of nettle-rash. They have proved fatal to men, children, and small animals. They are used for their flavour in confectionery, but seldom employed medicinally. By expression they yield the innocent fixed Oil of Almonds.

Oil of Bitter Almonds, though not officinal, requires to be noticed, as it is sometimes employed therapeutically, and is, moreover, a very powerful poison. Ordinarily, Oil of Bitter Almonds is of a yellow amber-colour, and has an odour of Hydrocyanic acid in addition to its own, which is usually considered rather agreeable. It has a bitter and burning taste, from containing Hydrocyanic acid (8·5–14·33 per cent.) with some other substances. The Sp. Gr. of this oil varies considerably. It is often adulterated with alcohol, but Mr Redwood states that no reliance can be placed on the Sp. Gr. to detect this adulteration. The essential part of the oil is *Hydruret of Benzule*. This, when pure, has a Sp. Gr. of 1·043. It is colourless and limpid, has the peculiar almond flavour, but is not poisonous when pure.* But the crude or commercial *Oil of Bitter Almonds* contains also *Hydrocyanic acid*, *Benzoic acid*, *Benzoine*, and some other ingredients. The two last-mentioned are produced by the decomposition of the *Hydruret of Benzule* ($Bz\ H = C_{14}\ H_5\ O_2 + H$). The Benzoic acid, in the form of a crystalline deposit, is apt to separate from oil which has keen kept for some time. The H Cy may be separated from the oil (by means of sol. Nit. Silver), leaving it soluble only to a small extent in water, but very readily in Alcohol and Ether. Mr Redwood detects adulteration with spirit by adding to the oil an equal bulk of Nitric acid of Sp. Gr. 1·5. If the oil be pure, no immediate change takes place; but when any alcohol is present, there

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* See experiments by Dr Maclagan, *Pharm. Journ.* xiii. 277.

is soon a brisk effervescence, and a disengagement of nitrous vapours. (P. J. xi. 486.)

Action. Uses.—Poisonous, like Hydrocyanic acid, which it contains, and sometimes used for the same purposes, in doses of ♏ ¼ to ♏ j. ; also for flavouring.* If freed from the H Cy, it may be used without danger.

PRUNUM, B. Prunus domestica, *Linn.* The Plum. The Dried Fruit (drupe.) Prunes.

The common Plum-tree is supposed to be the κοκυμηλέα of Dioscorides ; but this may have been *Prunus Cocomilla* of Tenore, a native of Calabria, a species which is supposed by some to be the original of the former. The astringent juice of *Prunus spinosa*, or the Sloe, inspissated, is substituted for the ancient *akakia*.

A small tree with smooth branches and elliptical leaves. Flower-buds formed of one or two flowers. Petals white, oblong-ovate. Drupes fleshy, ovate-oblong. Nut smooth or furrowed, without small holes.—Many varieties of it are cultivated everywhere in Europe. It occurs apparently wild in some places, but it is thought to be originally a native of Asia.

The fruit in a dried state forms the Prunes or French Plums of the shops, which are prepared in France chiefly from the St Catharine and the Green-gage varieties, and "in Portugal from a sort which derives its name from the village of Guimaraens, where they are principally dried." A variety (the *Quetsche*) is also dried in Germany. The black Plums "*dits à médecine*," are prepared from the small black Damascus Plums, and are more acid and laxative. (Merat and De Lens.) Prunes are composed, like the other fruits of this family, of a large proportion of water, with about 20 per cent. of solid matter, consisting of Sugar, Gum, Malic acid, some azotised matter, Pectin, and ligneous fibre.

Action. Uses.—Demulcent, Dietetical, Laxative. Given entire or in decoction, or in the form of the prepared pulp. Prunes form an ingredient in the Confect. Sennæ.

LAURO-CERASI FOLIA. B. Prunus laurocerasus, *Linn.* Cerasus Lauro-Cerasus, *Loisl.* and *Dec.* Cherry Laurel. The Fresh Leaves.

This shrub, so common in every garden in England, is a native of Asia Minor, especially near Trebizond, whence it was introduced into Europe by Clusius about 1576.

A small tree, or smooth evergreen shrub. Leaves with short petioles, oblong, acuminate, remotely serrated, shining on the upper surface, with 2 or 4 glands beneath, and coriaceous in texture. Racemes simple axillary, about the length of the leaves. Petals, white, roundish, spreading. Stamens 20. Drupe destitute of bloom, round, black, about the size of a small cherry.—Nees von E. 317; St. and Ch. ii. t. 117.

This plant, being commonly called Laurel, and found in every

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[*] Dr Pereira remarks that though its strength is variable, it is in general four times the strength of officinal Hydrocyanic acid, and that fʒij. of the Oil in *Rectified Spirit* fʒvj. form a useful essence for flavouring and scenting.

shrubbery, must not be confounded, as it usually is, with the true Laurel or Sweet Bay (*v. Laurus nobilis*), which does not possess any of its deleterious properties. It should also be distinguished from the Portugal Laurel (*Cerasus lusitanica*). The leaves alone are officinal. In their dried state they are bitter and astringent, without aroma; as also in the fresh state, until they are bruised, when the ratifia odour peculiar to so many of *Amygdaleæ* is exhaled, from the formation probably of an essential Oil and Hydrocyanic acid, in the same way as in the Bitter Almond, by the reaction of different principles on each other. Dr Christison has made the important observation, that the buds and unexpanded young leaves in May or June yield 6·33 gr. of Oil in 1000, but that the proportion sinks to 3·1 gr. in July, and goes on gradually diminishing to only 0·6 in the subsequent May, when they are twelve months old, and when the new unexpanded leaves of the same plant give ten times as much. By distillation with water, the Essential Oil is obtained, which exactly resembles that of Bitter Almonds; but the Distilled water is alone employed.

Fig. 65.

Action. Uses.—Poisonous, Sedative. The powdered leaves have been given in doses of from gr. iv.–gr. viij., and in cataplasms with Flour or Linseed-meal are sometimes applied to sores.

AQUA LAURO-CERASI, B. Water of the Cherry Laurel. Laurel water.

Prep. B.—Take of *Fresh Leaves of Common Laurel* ℔j., *Water* Oijß. Chop the leaves, crush them in a mortar, and macerate them in the Water for twenty-four hours. Distil one pint of liquid. Shake the product, filter through paper, and preserve in a stoppered bottle.

Action. Uses.—Poisonous, Sedative, used in the same cases as Diluted Hydrocyanic acid, in doses of ♏x.–♏xxx. The quantity of H Cy is variable. It is a highly uncertain and dangerous preparation, and was very properly omitted in the L. P.

The inner bark of the *Cerasus virginiana*, or wild Cherry-tree of North America, is extensively used as a medicine in that country. It contains a bitter principle, also *Amygdaline* and *Emulsine*, which produce Hydrocyanic acid, as in the Bitter Almond. It is thus tonic and antiperiodic, and in large dose sedative. It is given in doses of gr. xxx.–gr. xl. in intermittent fevers, and in phthisis. The infusion (½ oz. to 16 oz.) does not contain the H Cy, but is tonic in doses of ℥j.–℥ij. The resinous extract called "*Prunin*," is also a simple bitter. Dose gr. j.–gr. ij. The bark of the Wild Cherry is well worthy of a trial by medical practitioners in this country.

ACIDUM HYDROCYANICUM DILUTUM, B. Dilute or Medicinal Hydrocyanic Acid; the acid constituting 2 per cent. of the solution. F. *Acide hydrocyanique.* G. *Blausaure.* Prussic Acid.

Hydrocyanic acid is so named from being a compound of Hydrogen and Cyanogen, and is called Prussic acid because it was first obtained from Prussian Blue (p. 168). Scheele in 1782 first obtained it diluted, and Gay-Lussac in 1815 in a pure state. It was employed in medicine in 1809 by Brera, in 1817 by Majendie, and in 1819 by Dr A. T. Thomson in this country. But its effects had long previously been obtained by the employment of the above Laurel water.

Hydrocyanic' is of vegetable origin, being contained, as above mentioned, in the Distilled Oil and Waters both of the Bitter Almond and of the Cherry Laurel. It may also be obtained from many others of the Amygdaleæ, as kernels of Peaches, and of various Plums and Cherries; also from some of the flowers, and from Apple-pips. It is, however, usually obtained by decomposing some of the compounds of Cyanogen.

CYANOGEN ($C_2N = Cy = 26$), is so named from *κύανος*, *blue*, and *γε ναω*, *I generate*, because it is an essential constituent of Prussian Blue. Though a compound body, it acts the part of a simple body in entering into chemical combination, and is usually adduced as a type of organic radicals (p. 62). It is composed theoretically of equal volumes of Carbon and of Nitrogen, or of 2 Eq. C + 1 Eq. N., and is therefore a Bicarburet of Nitrogen, being, when isolated, a colourless permanent gas, with a penetrating and peculiar odour. Its compounds are called Cyanides or Cyanurets; of these some are found in various animal secretions. Cyanogen, in various conditions, may be produced by heating nitrogenised organic matter in contact with a base. Hence some of the salts which are employed in making Hydrocyanic acid are obtained from animal matter. Cyanogen is interesting to us as combining with Hydrogen to form this acid.*

Hydrocyanic acid (H Cy=27), called also Cyanide of Hydrogen, was obtained by Gay-Lussac in a pure anhydrous state. This solidifies at the zero of F., but readily becomes liquid with heat, when it is transparent and colourless; has a Sp. Gr. of nearly 0·697 at 64° F., tastes at first cool, then acrid; but it can be tasted only with the greatest caution. It has a strong and very peculiar odour, differing from that of the Oil of Bitter Almonds. If a few drops be placed on paper, a part will volatilise so readily as to freeze the rest. It boils at 79° or 80°, when the acid rises in the state of vapour, which is combustible, and will form explosive mixtures with Oxygen. It rapidly decomposes, becoming of a reddish-brown colour, and finally exhaling an ammoniacal odour. Dr Christison states, however, that he has kept it unaltered at 32° for three weeks. It has a feeble reaction as an acid, and forms Hydrocyanates (*i.e.*, Cyanides), which are liable to decomposition. It is very soluble in Alcohol and in water, the solution in the latter forming the following.

Medicinal or Diluted Hydrocyanic acid.—This differs from the former chiefly in its strength, having the same characteristic taste and odour, though in a less degree. The odour is so peculiar as to be enumerated among its tests. "But care must be taken not to confound it with the odour of Bitter Almond Oil, as many do; for that odour is decidedly different, and depends much more on a true Essential Oil than upon the concentrated Hydrocyanic acid." (*c.*) It differs also in being more easily preserved, which is especially the case when it has been made by the action of S′ on Ferrocyanide of Potassium; or when it has a small quantity of some other acid mixed with it; or is kept in a dark-coloured bottle, or in one covered with paper, and well stopped. The medicinal acid of the shops has been found to vary in the proportion of the strong acid it contains, from 1·4 to 5·8 per cent. The strength of the acid of the B. P. is 2 per cent., that of the L. P. also 2 per cent.; that of the E. P. was 3·84 per cent.; that of the D. P. about the same as L. Fearful consequences have ensued from the want of uniformity in its preparations; hence the B. P. gives direction for ascertaining its strength. (*See* Tests.)

Strength of the Medicinal acid.—The Sp. Gr. is one criterion of

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* It seems that this poisonous acid may be formed spontaneously in some medicinal mixtures, when allowed to stand for some time. It has been thus discovered in a draught which contained Carb. Potash along with Tinct. of Hyoscyamus. (P. J. xiii. 632.)

its strength, and that of course is always lower as the acid is stronger. The acid of the B. P. has a Sp. Gr. of ·997. In the L. P., H Cy was directed to be prepared of such strength that 100 gr. of it should exactly precipitate 12·59 gr. of Nitrate of Silver dissolved in water. This precipitate is readily soluble in boiling Nitric acid, and 5 parts of it correspond to 1 of real acid. The B. P. 1867 gives a similar test. Dr Christison states that so rigorous a test would exclude nine-tenths of the acid even of respectable shops, and that "irregularity within certain limits may exist without the slightest danger or inconvenience in medical practice." A strict uniformity of strength in this poisonous liquid is, however, of the first importance. The only acid sold in the United Kingdom must now be of the strength of 2 per cent. To ascertain this strength the B. P. gives a similar quantitative test. 270 gr. *of the acid rendered alkaline with solution of Soda, requires* 1000 *measures of the volumetric sol. Nitrate Silver before a permanent precipitate begins to form, which corresponds to* 2 *per cent. of Anhydrous acid.* When this quantity of the silver salt is added, the Cyanide of Silver is precipitated. (The acid with the Soda forms Cyanide of Sodium; with Nit. Silver this forms Nitrate of Soda, and Cyanide of Silver. The latter, however, is not precipitated as long as a certain quantity of Cyanide of Sodium remains undecomposed, as the two Cyanides unite to form a soluble double salt. When there is no longer enough Cyanide of Sodium left, the excess of Cyanide of Silver precipitates). Dr Ure has suggested ascertaining the quantity of Red Oxide of Mercury which a given weight (say 100 gr.) of this acid will dissolve; and as the Eq. of the Oxide, 108, is to an Eq. 27 of the acid in Cyanide of Mercury, as 4 to 1, so we have only to divide by 4 the weight of Oxide dissolved, and the quotient will represent the quantity of anhydrous acid present.

Another simple mode of testing has been proposed. It consists in the employment of a test solution of Iodine, of known strength. This is added by drops to the liquid containing H Cy. A colourless Cyanide of Iodine is produced. As soon as enough is added there is seen the yellow tinge of free Iodine. For each equivalent (127 parts) of Iodine thus consumed, an equivalent (27 parts) of H Cy is indicated. From this the percentage may be calculated.

Prep.—B. Take of *Yellow Prussiate of Potash* (*Ferrocyanide of Potassium*), ℥ij¼.; *Sulphuric acid*, ℥j.; *Distilled water*, f℥xxx., or a sufficiency, Dissolve the Ferrocyanide of Potassium in ℥x. of the water, then add the Sulphuric acid previously diluted with ℥iv. of the water and cooled. Put the solution into a flask or other suitable apparatus of glass or earthenware, to which are attached a condenser and a receiver arranged for distillation; and having put ℥viij. of Distilled water into the receiver, and provided efficient means for keeping the condenser and receiver cold, apply heat to the flask, until by slow distillation the liquid in the receiver is increased to f℥xvij. Add to this ℥iij. of Distilled water, or as much as may be sufficient to bring the acid to the required strength, so that gr. c. (or 110 minims) of it, precipitated with a solution of Nitrate of Silver, shall yield gr. x. of dry Cyanide of Silver.

The process resembles that of the L. P. With ℥ij. of Ferrocyanide, and ʒvij. of Sulphuric acid of the L. P., the product measured ℥xx.

A simple process is that originally recommended by Mr Everitt, which may be adopted for extemporaneously obtaining Dil. H Cy. *Cyanide of Silver*, gr. xlviijß, are to be added to *Aq. dest.*, f ℥j. with which *Hydrochloric acid*, gr. xxxixß had been previously mixed, and well agitated together in a close phial. (The Hydrogen of the acid combining with the Cyanogen of the Cyanide, Hydrocyanic in the proportion of 2 per cent. is formed. The Chlorine set free combining with the Silver, forms a white precipitate of Chloride of Silver.) After a short interval, the clear liquor is to be poured off, and kept out of the light.

Another way in which the acid is sometimes prepared is to distil *Hydrochloric acid* with *Cyanide of Mercury*. It is now seldom adopted. The Society of Apothecaries used to obtain it by a process similar to this: Sp. Gr. 0·995, indicating 2·9 per cent. of real acid. By a similar process, but without water, Gay-Lussac obtained the anhydrous acid, by passing it through pieces of Chalk and of Chloride of Calcium.

It has already been stated (p. 167) that Ferrocyanide of Potassium consists of a bibasic radical, Ferrocyanogen ($Fe\,Cy_3$) in combination with two equivalents of Potassium. In the above process this salt is decomposed by the action of Sulph. acid; the results of this decomposition being *Hydrocyanic acid*, which distils over; and *Bisulphate of Potash*, with a peculiar compound called *Yellow Salt*, which both remain behind in the retort. 2 eq. of the crystallised Ferrocyanide ($Fe\,Cy_3, K_2 + 3\,Aq.$) are acted upon by 6 eq. of Sulph. acid ($S\,O_3, H\,O$). 3 eq. of water are decomposed. Of the 6 eq. of Cyanogen 3 combine with $3\,H$ to form 3 eq. of Hydrocyanic acid. The $3\,O$ of the water unite with $3\,K$ to form 3 eq. of Potash, which combines with the $6\,S\,O_3$ to form 3 eq. of Bisulph. Potash. 1 eq. of Potassium and 3 of Cyanogen remain; these unite with $2\,Fe$ to constitute 1 eq. of yellow salt. This compound (K, Cy_3, Fe_2) is exactly the reverse of Ferrocyanide of Potassium, as regards the proportions of Potassium and Iron. 9 eq. of water are left. These somewhat complicated changes may be thus expressed by an equation—

$$2\,(Fe\,Cy_3, K_2 + 3\,Aq.) + 6\,(S\,O_3, H\,O) = 3\,H\,Cy + 3\,(K\,O, 2\,S\,O_3) \\ + (K, Cy_3, Fe_2) + 9\,Aq.$$

The constituents of yellow salt have been differently deduced by Gay-Lussac and Mr Everitt; but the former having attended most to theoretical considerations, and the latter to the results derived from numerous experiments, his numbers are preferred, and are those adopted by Mr Phillips. But Dr Pereira, in repeating the experiments, agrees with Gay-Lussac in the colour of the salt, which the latter states to be white, while Mr Everitt found it to be yellow. This he observed to be owing to the admission of air; for when the action was made to take place without the admission of the air, the salt precipitated was always white.

Adopting Berzelius' view of the composition of the Ferrocyanides, the proportion of the substances submitted to distillation, and the results where 6 equivalents of Sulphuric acid are heated with 2 equivalents of Ferrocyanide of Potassium, may be thus stated :—

Submitted to Distillation.		*Results of Distillation.*	
6 eq. Sulphuric acid . . .	240	3 eq. Bisulphate of Potash . . .	381
{4 „ Cyanide of Potassium	260	3 „ Hydrocyanic acid	81
{2 „ Cyanide of Iron . . .	108	1 „ Cyanide Potassium 65 {yellow salt}	173
12 „ Water {6 in the acid 6 in the salt}	108	2 „ Cyanide Iron . 108	
		9 „ Water	81
	716		716

Tests.—Besides ascertaining the strength of H Cy, it is necessary to determine its purity.

It is colourless; entirely vaporisable, with a peculiar odour; slightly and transiently reddens Litmus; is unaffected by Sulphuretted Hydrogen (showing absence of Cyanide of Mercury, &c.) Solution of Chloride of Barium causes no precipitate (no $S O_3$). The presence of any other acid is indicated by the Iodo-cyanide of Mercury and Potassium being reddened (in consequence of the formation of Iodide of Mercury). Hydrocyanic acid gives with Nit. Silver a white precipitate entirely soluble in boiling Nitric acid (no H Cl). The slight effect on Litmus, as well as the Chloride of Barium test, prove also that there is no Sul′ or H Cl.

To detect this acid in cases of poisoning, its odour is a delicate and usually very conspicuous test. The contents of the stomach may be washed and filtered ; or, in cases of mixed fluids, these may be treated with animal charcoal without heat, neutralised with Sul′ if they are alkaline from Ammonia disengaged during putrefaction, and about $\frac{1}{8}$th part distilled over in a vapour bath, applying the following tests.

1. Supersaturate with solution of Potash, then add a solution of the salts of the mixed Peroxide and Protoxide of Iron (as common Green Vitriol, or the Tincture of the Sesquichloride), when a greyish-green precipitate is formed, which, on adding a little Sul′, becomes of a deep Prussian Blue colour. (For explanation of this test, *see* p. 168.)

2. Nitrate of Silver causes a precipitate of Cyanide of Silver, which is soluble in boiling Nitric acid.

3. Sulphate of Copper, added in solution to Hydrocyanic′ supersaturated with Potash, forms a greenish precipitate, which, on the addition of a little Hydrochloric acid, becomes nearly white.

Consult works on Forensic Medicine, as of Christison and Taylor.

Action. Uses.—Sedative and Anodyne. A powerful Poison. Useful in Chronic Coughs and in affections of the Heart, in painful Neuralgia, and Stomach complaints, as Gastrodynia. Externally as a wash to allay pain and irritation in chronic Skin Diseases.

Dose.—♏ij.–♏v., in an ounce or so of water or Emulsion. As a Lotion, f℥ij. in Oß of Rose water or common Distilled water.

Antidotes.—In cases of poisoning, it acts so quickly and energetically, that few antidotes can be effectively employed. 1. Cold affusion is usually most quickly available; and applied chiefly as cold *douche* to the Head and Spine, is particularly useful. 2. *Ammonia* or its Carbonate, cautiously inhaled, or in solution taken internally, or rubbed externally, is useful from its stimulant properties. 3. *Chlorine*, in the form of gas much diluted, cautiously inhaled, or Chlorine water, in doses of a tea-spoonful or two, or the Chloride of Lime or of Soda, may be prescribed. Artificial respiration ought not to be neglected. When in time, it is best to give as a chemical antidote the moist Peroxide of Iron, or a solution of Carbonate of Potash, followed immediately by a solution of the mixed Sulphates of Iron.

The Messrs Smith of Edinburgh published in the *Lancet* of 5th Oct. 1844, detailed instructions for preparing a Prussic acid antidote, the supposed efficacy of which depends on the presentation to the acid of Iron in such a state of oxidation as to form with it the comparatively inert Prussian Blue. They afterwards gave the following in the *Pharm. Journ.* v. 35, July, 1845.

Dissolve in a phial *Carbonate of Potash* (Salt of Tartar) gr. xx. in water f℥j. or f℥ij. Dissolve quickly in a mortar *Sulphate of Protoxide of Iron* gr. x. in *Water* f℥j., and add of *Tinct. of Sesquichloride* (Muriate) *of Iron* fʒj., and put in another phial. To prevent delay, let the dispenser go at once, and himself give to the person who has taken Prussic acid first the Potash solution, and immediately afterwards that of the salts of Iron.

In most cases of Hydrocyanic acid poisoning, all antidotes are useless, because too late.

VAPOR ACIDI HYDROCYANICI, B. Inhalation of Hydrocyanic Acid.

Prep.—Take of *Diluted Hydrocyanic acid*, ♏x.-♏xv.; *Water* (cold), fʒj. Mix in a suitable apparatus, and let the vapour that arises be inhaled.

Introduced in 1867. To be used cautiously in painful affections of the larynx and fauces.

MYRTACEÆ, *R. Brown*. Myrtle Family.

The Myrtaceæ are elegant in appearance. They abound in the tropical parts of New Holland and of America, are fewer in Asia and Africa, rare in the south of Europe. They secrete much astringent matter, as well as grateful Volatile Oil. Some therefore are employed as astringents, others as spicy aromatics. The fruit of some being berried, with a grateful acid and sweetish secretion, form edible fruits.

Tribe I. LEPTOSPERMEÆ, *Dec.* Sub-tribe, *Melaleuceœ.*

Character of the tribe:—Fruit capsular.

OLEUM CAJUPUTI, B. Melaleuca Minor, *Dec.* Oil distilled from the leaves. *Polyadelphia Icosandria*, Linn. Cayaputi Oil, or Oil of Cajeput. (From Batavia and Singapore.)

Cajuputi Oil, pronounced *Kayapootee* (meaning *Arbor alba*) in the East, appears to have been known only since the time of Rumphius, who describes two trees.—1. *Arbor alba major*, H. A. ii. t. 16. 2. *Arbor alba minor*, H. A. ii. t. 17, f. 1. In 1798, Mr Smith, of the Calcutta Botanic Garden, was sent to the Molucca Islands to obtain the true Cayaputi plant. He obtained several which were introduced into the above Garden, and have since been distributed all over India. It is curious that this species, though a native of Molucca, is able to stand the cold of N.-W. India, probably owing to the thickness of its bark. Mr S. having also sent specimens to this country, they were ascertained by Dr Maton to be those of the second kind of Rumphius, and named *Melaleuca Cajaputi* in the London Pharm. for 1809, a name which Dr J. E. Smith afterwards changed to *M. minor*. The other species, which the Malays also call Cayaputi, is the *Melaleuca Leucadendron*, of which the leaves are larger, more falcate, 5-nerved, and smooth, but possess little or no fragrance, and are not known to yield any of this celebrated Volatile Oil.

Fig. 66.

Melaleuca minor, Dec. (fig. 66), forms a small tree with an erect but crooked stem covered with thick, rather soft, light-coloured bark; branches scattered, with slender twigs, which droop like those of the Weeping Willow. Leaves alternate lanceolate, acute, slightly falcate, 3 to 5-nerved, while young silky, and diffusing a powerful odour when bruised. Spikes terminal and from the extreme axils, downy as well as the calyx and branchlets, while in flower there is only a scaly conic bud at the apex, which soon advances into a leafy branchlet. Bracts solitary, 3-flowered. Calyx urceolate (fig. 66, 3), limb 5-parted. Petals 5, white, scentless. Stamens from 30 to 40, in five bundles; filaments 3 or 4 times longer than petals. Anthers incumbent, with a yellow gland at the apex. Style long. Stigma obscurely 3-lobed. Ovary ovate, and like the capsule 3-celled (fig. 66, 2 and 1), many-seeded, lower half united with, but the capsule is enclosed within the thickened tube of the calyx. Seeds angularly wedge-shaped. *Melaleuca Cajaputi* of Roxburgh. A native of the Molucca Islands, especially of Boerou, Manipe, and of the S. of Borneo. It is called *Daun kitsjil*, also Cajuputi.

The leaves are collected on a warm dry day in autumn, and placed in dry sacks, in which they nevertheless become heated and moist. They are next cut in pieces, macerated in water for a night, and then distilled. Two sackfuls of the leaves yield only about 3 drachms of the oil. This is clear and limpid, of a light-green colour, very volatile, diffusing a powerful odour; having a warm aromatic taste, something resembling that of Camphor, followed by a sense of coolness. Sp. Gr. 0·914 to 0·927. It is soluble in Alcohol. It boils at 343°.

When distilled with water, a light and colourless Oil first comes over, and then a green-coloured and denser Oil, which, with less odour, is more acrid. Comp., according to Blanchet, $C_{10}\ H_9\ O = 77$. Some adulterations have been occasionally practised with this Oil, especially at the time when it reached a high price, when it was mixed with the Oils of Rosemary and of Camphor; but it is now commonly met with in a pure state, and without any admixture of Copper, such as has been suspected.

Action. Uses.—Diffusible Stimulant, Antispasmodic; used externally in Rheumatism. Surprise was excited in India when Cayaputi Oil was stated to be a cure for Cholera, as Oil of Pepperment was there found equally useful.

Dose.—♏iij.-♏v. given on a lump of Sugar.

SPIRITUS CAJUPUTI, B. Spirit of Cajuput.

Prep.—Oil of *Cajuput*, ℥j.; *Rect. Spirit*, ℥xlix. Dissolve. (One-fifth the strength of B. 1864.)

Dose.—ʒß-ʒj.

Tribe II. *Myrteæ.*

Character of the Tribe:—Fruit baccate.

CARYOPHYLLUM, B. Caryophyllus aromaticus, *Linn.* Dried unexpanded Flower-bud. Cloves. *Icosand. Monog.* Linn.

Though it is doubtful whether the ancients were acquainted with the Clove, it is curious that the Arabs give *kurphullon* as its Greek name. P. Ægineta and Myrepsius seem to have known it; yet Dr Royle is of opinion that the ancients were not well acquainted with any substances produced further east than the coasts of the Bay of Bengal.

The Clove-tree is an evergreen, and, like others of the Myrtaceæ, elegant in appearance. It is like the Pimento. The wood is hard and covered with a smooth grey bark. The leaves opposite and decussate, ovate-lanceolate, tapering towards both ends, about 4 inches long, somewhat leathery, shining, and minutely dotted, diffusing a clove-like fragrance when bruised. Panicles short, trichotomously divided, jointed at every division. The calyx tube is cylindrical, of a dark purple colour, adhering to the ovary, divided into 4 ovate concave segments. Petals 4, overlapping each other, and of a globular form when in bud, afterwards spreading, roundish, whitish, and said to exhale a grateful odour. Within the calyx and at the top of the ovary is a quadrangular disk, surrounding but not embracing the base of the short obtuse style. Stamens in 4 bundles, filaments long, yellow. Ovary nearly cylindrical, 2-celled, with many small ovules in each cell attached to the sides of the dissepiment. Fruit a large elliptical berry, containing a single seed, by the growth of which the second cell and numerous ovules have been obliterated. Embryo, large, elliptical, dotted. Cotyledons unequal, sinuose, the larger one partly enveloping the smaller, including the superior radicle.—See the Bot. Mag. t. ii. 749, for a full description; Dict. des Sciences, Nat. Bot. for detailed dissections. A native of the Moluccas, but confined by the Dutch to Amboyna and Ternate. It has, however, been introduced into the Mauritius, India, the West Indies, and Guyana, and is cultivated at Penang and at Bencoolen in Sumatra.

Cloves, the unexpanded flower-buds, are picked by hand or with long reeds, and then quickly dried in the shade. The best are obtained from the Moluccas. They are exported from Penang, Bencoolen, and Amboyna. They have some resemblance to a nail (whence the French name of *clou de girofle*), are usually of a dark-brown colour, with a pleasant odour, and a warm aromatic, even burning taste. They have a considerable weight. The best will exude a little Oil when pressed or scraped. Their active properties are extracted by water and by Alcohol. They consist, according to Trommsdorf, of Volatile Oil 18, a peculiar Tannin 13, Gum 13, Resin 6, Extractive 4, Lignin 28, water 18=100. The Oil is officinal. The resinous principle has been named *Caryophyllin*, and is obtained in brilliant satiny crystals, without taste and without smell, fusible, volatile, insoluble in water, soluble in Alcohol; said to be isomeric with Camphor. The dried berries, called *Mother Cloves*, are still imported into China.

Action. Uses.—Stimulant Carminative. Used as a condiment and corrective, and for flavouring medicines.

OLEUM CARYOPHYLLI, B. Oil of Cloves. (Distilled in Britain.)

Oil of Cloves is usually imported from Amboyna. In America it is said to be distilled from the Cloves grown in Cayenne. In the B. P. it is described as "oil distilled in Britain from Cloves." The Cloves from which oil has been distilled are apt to be intermixed with others. The Oil, when recent, is clear and colourless, but by degrees becomes of a dark-brown colour, which is its ordinary appearance. Its odour is strong, and its taste warm, aromatic, and even acrid. Sp. Gr. 1·05 to 1·06; being thus heavier, it sinks in water. It is best distilled with salt and water, as in the case of other heavy oils, and requires repeated cohobation. M. Ettling, according to Soubeiran, finds this Oil composed of—1. *A Hydrocarbon*, like Essential Oil of Turpentine, which is lighter than water. 2. *An oxygenated Oil*, which is heavy, Sp. Gr. 1·079, and has some of the properties of an acid (*acide eugenique* of Dumas), and composed of $C_{24}\,H_{15}\,O_5$. By mixing Oil of Cloves with Potash, the *light oil* may be distilled off from the *heavy oil*, which combines with the base; and the latter may subsequently be obtained by distilling its potash salt with Sulph. acid. 3. *Stearoptene*, which is also sometimes met with in distilled water of Cloves. If Oil of Cloves be dissolved in Alcohol, and some Sol. Protochlor. Iron added, a deep Indigo blue colour is produced, which is considered characteristic of the Oil. (Ulex.)

This Oil is sometimes mixed with the Oils of Pimento and Cassia.

Action. Uses.—Aromatic stimulant, Carminative, and used as a corrective in doses of ♏ij.–♏v.

INFUSUM CARYOPHYLLI, B. Infusion of Cloves.

Prep.—B. Infuse in a covered vessel for half an hour *bruised Cloves* ℥i in boiling *Aq. dest.* Oß. Strain.

Action. Uses.—A clear infusion, with the odour and taste of

Cloves, incompatible with preparations of Iron. Useful as a warm carminative, or as a vehicle for other medicines, in doses of f℥jß.

Off. Prep.—Mist. Ferri Aromatica. Vinum Opii. Infusum Aurantii Co. Confect. Scammonii. Pil. Colocynth. Co., Pil. Col. et Hyoscyami.

PIMENTA, B. Eugenia Pimenta, *Linn.* Dried unripe Berries. Pimento. *Icosand. Monog.*, Linn.

A native of South America and the West Indies. In the latter it is much cultivated in regular walks. Besides Pimento, it is also called Allspice and Bay-berry tree.

An elegant tree about 30 feet high, foliage dense and evergreen, branches round, twigs compressed, the younger as well as the pedicles pubescent. The leaves are petiolate, oblong or oval, marked with pellucid dots, smooth. The peduncles axillary and disposed in terminal trichotomous panicles. Calyx and petals 4-fid, the latter reflected greenish-white. Stamens numerous. Ovary 2-3-celled; cells many ovuled. Berry spherical, covered by the roundish persistent base of the calyx, which when ripe is smooth, shining, and of a dark purple colour; 1, rarely 2-celled; 2-seeded. Embryo roundish, cotyledons united into one mass, radicle scarcely distinct. Nees von E. 298. *Myrtus* or *Myrcia pimentoides* is figured in t. 297, and yields ovate Pimento.

Browne (*Nat. Hist. of Jamaica*) describes the berries as being gathered before they are ripe, because they can lose their aromatic warmth, acquire a taste like Juniper-berries, and are much eaten by birds. When gathered, they are carefully dried in the sun. They are round, rugose, unequal in size, of a brownish colour; and consist of the pericarp, in which the virtues chiefly reside, and of two dark-brown seeds. The odour is strongly fragrant, and the taste warm and aromatic. This depends on a Volatile Oil, which is separated by distillation. There is also some Fixed Oil, a pungent Resin, Extractive, Tannin, Gallic acid, &c.

Action. Uses.—Stimulant Aromatic. Carminative in doses of gr. x.–gr. xxx.

OLEUM PIMENTÆ, B. Oil of Pimento.

Obtained in the proportion of 1 to 4 per cent. by distilling bruised Pimento with water. It is made in England. It resembles and is sometimes sold for Oil of Cloves, or employed to adulterate it. Dr Pereira describes it as consisting of two Volatile Oils, one *light* (Hydrocarbon), the other *heavy* (Pimentic acid). It is colourless or slightly reddish when recent, becomes brown by age, and sinks in water. It produces a red colour with Nitric and a bluish-green with Tinct. of Sesquichloride of Iron; thus resembling Morphia in these particulars.

Action. Uses.—Stimulant Carminative in doses of ♏iij. to ♏vj. Rubefacient externally.

AQUA PIMENTÆ, B. Distilled Water of Pimento.

Prep.—B. Mix *bruised Pimento* ℥xiv., with *Dist. water* Cij. and distil off Cj.

Action. Uses.—Carminative. Much used as a vehicle for other medicines in doses of f℥jß.

GRANATEÆ, *Don.* Pomegranates.

This order was instituted by the late Professor Don for the Pomegranate, which was usually included, as it still is by Dr Lindley, among Myrtaceæ. It is chiefly distinguished by its leaves not being dotted, by the want of the marginal vein, by the peculiarities of its fruit, by the seeds being involved in pulp, and by its cotyledons being convuluted; also by the absence of aromatic properties, and the geographical distribution being beyond the range of tropical Myrtaceæ. Dr L. thinks that the several variations are not greater than occur in genera of other families, without their being raised to the rank of orders.

GRANATI RADICIS CORTEX, B. Punica Granatum, *Linn.* Bark of the Root of Pomegranate, fresh or dried. *Icosand. Monogyn.*, Linn.

The Pomegranate, a native of the mountainous countries from Syria to the north of India, must always have been an object of attention. It is the *rimmon* of the Bible, and the *rooman* of the Arabs. It was well known to the Greeks and Romans.

Stem arborescent and irregular, in arid situations rather thorny; the leaves usually opposite, often fascicled, oblong, inclining to lanceolate, quite entire, not dotted, smooth, shining, and of a dark green; flowers commonly solitary, of a brilliant scarlet; calyx thick and fleshy, adhering to the ovary, turbinate, 5 to 7-cleft; petals 5 to 7, crumpled; stamens numerous, often double; style filiform; stigma capitate; fruit of the size of a large apple, with a thick leathery rind, and crowned by the tubular limb of the calyx; cells several, arranged in two strata, separated from each other by an irregular transverse diaphragm, lower division of 3 cells, the upper of from 5 to 9 cells; seeds numerous, involved in pellucid pulp, with foliaceous, spirally convolute cotyledons.—Nees von E. 301.

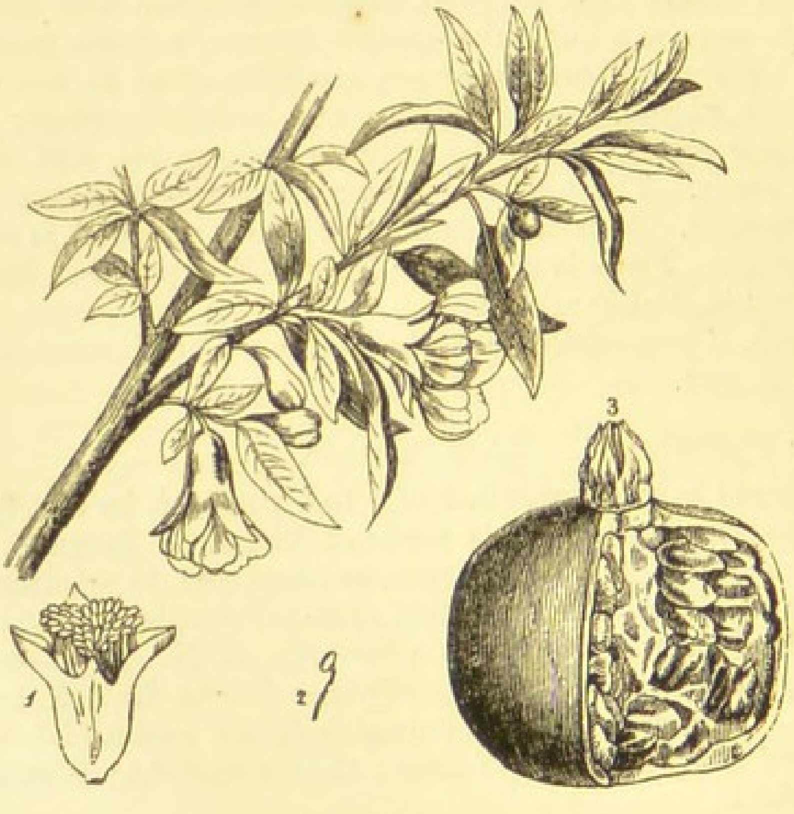

Fig. 67.

The parts of this plant which were employed by the ancients are all still used in the East. Thus the Flowers are the *Balaustion* of the ancients. In India, *buloositoon* is given as the Greek name of the double flower. They are devoid of odour, but have a bitterish and astringent taste, tinge the saliva of a reddish colour, contain Tannin, and strike a black with ferruginous salts. They are not now officinal.

The Rind of the Fruit (*Granatum*, L.), especially of the *wild* plant, is extensively employed as an astringent and as a dye in the East. It is of a reddish-brown colour and smooth externally, but yellow on the inside; occurs usually in irregular fragments, dry, hard, and leathery, of a very astringent taste. It contains of Tannin 18·8 per cent. with 10·8 of Extractive, and 17·1 of Mucilage, and is used for tanning in some countries.

The Bark of the Root (*Granati Radicis Cortex*, B.) was employed as an anthelmintic by Dioscorides and Celsus, and still is so in India. It was reintroduced into practice by Drs Buchanan and Anderson. It is now obtained from the south of Europe. The root itself is heavy, knotted, and of a yellow colour; its bark is sold in strips, quills, or fragments, sometimes with parts of the root still adhering to it. On the outside it is of a greyish-yellow colour; on the inside, yellow, something like that of the barberry. It has little smell; when chewed, colours the saliva yellow; and has an astringent taste, without any disagreeable bitterness. It has been analysed by Mitouart, Latour de Trie, and others; but the source of its peculiar anthelmintic powers has not been satisfactorily ascertained, and the subject requires further investigation. It contains Tannin (about 20 per cent.), Gallic acid, Resin, Wax, Fatty matters, and Mannite. "An infusion yields a deep-blue precipitate with the salts of Iron, a yellowish-white one with solution of Isinglass, and a greyish-yellow one with Corrosive Sublimate; and Potash or Ammonia colours it yellow." (*c.*) The substance discovered by Latour de Trie, and which he called *Granadine*, supposing it to be peculiar to this root-bark, has been since proved to be *Mannite*. But later investigators have indicated the presence of a peculiar acrid principle in this bark when fresh, which is said to have basic properties, and is called *Punicine*.

It is apt to be adulterated with the barks both of box and of barberry. The former is white and bitter, but not astringent; the latter yellow, very bitter and not similarly affected by the above four reagents.

Action. Uses.—All parts are astringent (the rind of the wild fruit especially so), and useful in Diarrhœa and advanced stages of Dysentery; the Flowers in infusion are slightly astringent; the Bark of the Root astringent, but remarkably useful as an Anthelmintic for the expulsion of tænia.

Dose.—When given for Tape-worm, a decoction may be formed as below. Of this f ℥ij.–f ℥iv. may be given in the morning fasting, and repeated every two hours, until three or four doses have been taken; pursuing the same course another day, if it does not act at first, and giving occasional doses of Castor Oil.*

Decoctum Granati Radicis, B. Decoction of Pomegranate-root.

Prep.—Boil sliced *Pomegranate root bark*, ℥ij. in *Aq. dest.* Oij. down to Oj., strain, and make up to Oj.

This is useful, especially as an Anthelmintic, and given as prescribed above. The fresh bark is most active.

[Decoctum Granati, L. Decoction of Pomegranate-rind.

Prep.—Boil *Pomegranate rind* ʒij. in *Aq. dest.* Ojß, down to Oj., and strain.

Action. Uses.—Astringent. *Dose.*—f℥j.–f℥iv.]

Cucurbitaceæ, *Juss.* Gourd Family.

The Cucurbitaceæ abound chiefly in warm parts of the world, but a few are found in temperate climates. A bitter, often purgative, principle is secreted by many of them; several by cultivation yield edible fruit, but even in these the rind continues bitter. The seeds contain much bland fixed oil.

Fig. 68.—Citrullus Colocynthis.

Colocynthidis Pulpa, B. Citrullus Colocynthis, *Schrad. Cucumis Colocynthis*, Linn. Dried decorticated fruit, freed from the seeds. Colocynth. Colocynth Pulp. *Monœcia Monadelphia*, Linn.

The Colocynth (κολυκυνθίς of the Greeks and *Hunzal* of the Arabs) has been used in medicine from the earliest times, and is one of the plants supposed to be the *Pakyoth* or *wild gourd* of Scripture.

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* Dr Budd informs Dr Royle that he has often prescribed the bark of the root of Pomegranate, and that he considers it as efficacious as Turpentine, and much safer, producing only a feeling of weight in the stomach, or nausea, apparently on account of the quantity taken. Dr Budd insists, as some others have done, upon the *fresh* root only being employed.

Annual Herb. Roots thick, whitish. Stems procumbent, angular, hispid. Leaves cordate-ovate, divided into many lobes; lobes obtuse (but rather acute in the Linnæan specimen, and as represented by St. and Ch. iii. t. 138, from a plant grown in Chelsea Garden from seed sent from the Mediterranean, and from which fig. 68 is taken), of a bright green on the upper surface, whitish below, and muricated, from being covered with small white hairs and often hair-bearing tubercles. Petioles as long as the lamina. Tendrils short. Flowers axillary, solitary stalked. Calyx with 5 subulate segments. Female flowers with the tube of the calyx globose, and somewhat hispid, the limb campanulate, with narrow segments. Petals small, yellow, with greenish veins, scarcely adherent to each other and to the calyx. Fruit globose, smooth, about the size of an orange, with a thin but dense rind, 6-celled, pulp very bitter. Seeds ovate, not marginate, whitish, sometimes brownish, bitter. Extending from the south of Europe to Syria and the south of India, north of Africa, Egypt, and Nubia. It is possible that in some of the localities usually cited, some nearly allied species may be found instead of the true Colocynth.

[Colocynth is found in various parts of India, as on the sandy lands of Coromandel (*Roxburgh*), Peninsula (*Wight*), Deccan (*Col. Sykes*), sea shores of Guzerat (*Gibson*), Kaira (*Burns*), and near Delhi (*Mackintosh and Rankin, see* Bengal Dispensatory—also *Falconer*). Dr. Royle heard of it in this direction, but on sending for *Indrayun* and *Bisloombha* plants, which are Arabian and Indian names for the Colocynth, a specimen of a nearly allied species, with oval instead of globular fruit, was obtained. This he named *C. Pseudo-Colocynthis*, and figured (Himal. Bot. t. 47, fig. 2). A good supply of Colocynth may therefore be obtained for the public service or for commerce, from India, whence indeed it has sometimes been imported. Dr Stocks has lately sent some of the Extract from Bombay.]

Colocynth is imported in two forms. 1. *Unpeeled*, from Mogadore in its entire state, and covered by its hard yellow rind. 2. *Peeled*, from the Levant (by Smyrna and Trieste), north of Africa (by France), and south of Spain; with the rind peeled or pared off, and the pulp dried when the fruit is ripe. It then appears in the shape of white balls, which are light, porous, and spongy, but tough, usually with the seeds forming about ¾ of the whole weight. The smaller variety of fruit is considered the best, and is sometimes imported with the seeds removed. This is always required to be done before any preparations can be made. The decorticated fruit is officinal, freed from the seeds. The seeds are bitter; but a good deal of the bitterness may be removed by repeating washings in water. The pulp is without odour, but nauseously and permanently bitter. It is with difficulty reduced to powder, and may therefore with a magnifier be seen in pills which have been made up with the pulp instead of from the Extract. Both water and Alcohol extract its active properties. Analysed by Meisner, the pulp was found to contain of Fixed Oil 4·2, Bitter Resin 13·2, Bitter Principle (*Colocynthin*) 14·4, Extractive 10, Gummy matters 30, Phosphate of Lime and Magnesia 5·7, Lignin 19·2. The *Colocynthin* is probably not a pure vegetable principle. Examined by Herberger and Braconnot, it proved of a reddish-yellow colour in mass, but yellow when in powder, transparent and friable, excessively bitter, burning like a resin, soluble in five parts of cold and in less boiling water; equally soluble in Alcohol and Ether. Acids and the deliquescent salts precipitate it as a coherent and viscid mass; alkalies do not precipitate it, neither does Gall-nut when it is quite pure. It contains Nitrogen, and, according to Braconnot, restores the colour of Litmus reddened by acid. (*Soubeiran.*)

Action. Uses.—Colocynth is a powerful Hydragogue Cathartic, but an irritant Poison in large doses.

[EXTRACTUM COLOCYNTHIDIS, L. Extract of Colocynth.

Prep.—L. Macerate *Colocynth* cut in pieces (rejecting the seeds) ℔iij. in (cold) *Dist. water* Cß for 36 hours, frequently pressing it with the hand. Press out the liquor strongly, and filter; lastly, evaporate to a due consistence.

The L. P. of 1836 employed too much water, and ordered boiling. By this means a large quantity of slimy mucus was taken up, and the Ext. was apt to become mouldy. In 1851 almost too little water was ordered. But the new Extract was much stronger than the last one. Mr Curtis finds that when made by the above L. formula the Ext. amounts to only 12 per cent. by weight of the Colocynth used, and that much of the bitter matter remains in the pressed pulp, and may be extracted by fresh maceration in water. A resinous material is taken up by the water, and subsides during the subsequent evaporation. Mr Squire recommends that this extract be prepared with Proof Spirit.

Action. Uses.—Cathartic, but seldom prescribed alone, though it may be given in doses of gr. v. to gr. x.]

EXTRACTUM COLOCYNTHIDIS COMPOSITUM, B. Compound Extract of Colocynth.

Prep.—B. *Colocynth pulp*, ℥vj.; *Extract of Socotrine Aloes*, ℥xij.; *Resin of Scammony*, ℥iv.; *Hard Soap* in powder, ℥iij.; *Cardamom seeds* in fine powder, ℥j.; *Proof Spirit*, Cj. Macerate the Colocynth in the Spirit for four days; press out the tincture, distil off the Spirit; add the Extract of Aloes, the Soap, and the Scammony, evaporate the residue by a water bath to a pilular consistence, adding the Cardamoms towards the end of the process.

This resembles the Comp. Colocynth Pill of the L. P. (Comp. Extract, 1836), which contained 1 part of Ext. Colocynth to 6 of Ext. Aloes, and 4 of Scammony, with Soft Soap, no Spirit being used. (*See* P. J. xii. and xiv.)

Dose.—Gr. v.–gr. x.

PILULA COLOCYNTHIDIS COMPOSITA, B. Compound Colocynth Pill.

Prep.—B. *Colocynth* in powder, ℥j.; *Barbadoes Aloes* in powder, ℥ij.; *Scammony* in powder, ℥ij.; *Sulphate of Potash* in powder, ℥¼; *Oil of Cloves*, fʒij.; *Distilled water*, a sufficiency. Mix the Powders, add the Oil of Cloves, and beat into a mass with the aid of the Water.

It resembles the Comp. Colocynth Pill of the E. P. Supposing the Extract to be three times as strong as the Colocynth pulp, it contains six times as much of Scammony as of Ext. Colocynth. The last preparation contains only twice as much. The Sulph. Potash adds but slightly to the cathartic action.

Action. Uses.—As Colocynth taken alone is much more griping and irritating than when prescribed with other Cathartics, the Compound Pill is a safe and energetic purgative. The addition of a little Calomel makes it still more useful.

Dose.—Gr. v.–gr. x.

PILULA COLOCYNTHIDIS ET HYOSCYAMI, B. Colocynth and Henbane Pill.

Prep.—Beat *Comp. Colocynth Pill* ℥ij., and *Extract of Hyoscyamus* ℥j., into a uniform mass.

Action. Uses.—The addition of the Henbane (⅓) deprives the pill of its tendency to gripe and irritate, and therefore makes this form applicable to all the same cases as the above.

A *Tincture* and a *Wine of Colocynth* are employed sometimes on the Continent. A little of the former, or gr. xx. of the powder mixed with lard, and rubbed on the abdomen, will sometimes produce a full cathartic effect.

Ecbalii Fructus, B. Ecbalium officinarum, *Rich.* The Fruit, very nearly ripe.

Elaterium, B. A sediment from the juice of the fruit. *Momordica Elaterium*, Linn. Squirting Cucumber.

The plant was known to the Greeks, and called *Σίκυς ἄγριος*, and sometimes *Ελατήριον*, a name which was also applied to the feculence of the juice of its fruit. By Richard it has been formed into a genus, Ecbalium, and the species called E. officinarum. (*E. agreste*, Rchb.)

Annual, with hispid, scabrous, trailing stems, which are glaucous and without tendrils. Leaves cordate, somewhat lobed, crenately toothed, very rugose, on long bristly stalks. Flowers monœcious. ♂ Calyx 5-toothed. Corolla yellow 5-parted. Stamens triadelphous, with connate anthers. ♀ Filaments 3, sterile. Style trifid. Stigmas bifid. Ovary 3-celled, with many ovules. The fruit ovate, 1½ inch long, muricated, when mature, being freed from its petiole, and contracting with elasticity, it forcibly projects the juice and seeds from a basilary orifice. Seeds of a brown colour, compressed, reticulate. A native of the south of Europe, cultivated in England.—Esenb. and Eberm. 272; St. and Ch. i. 34.

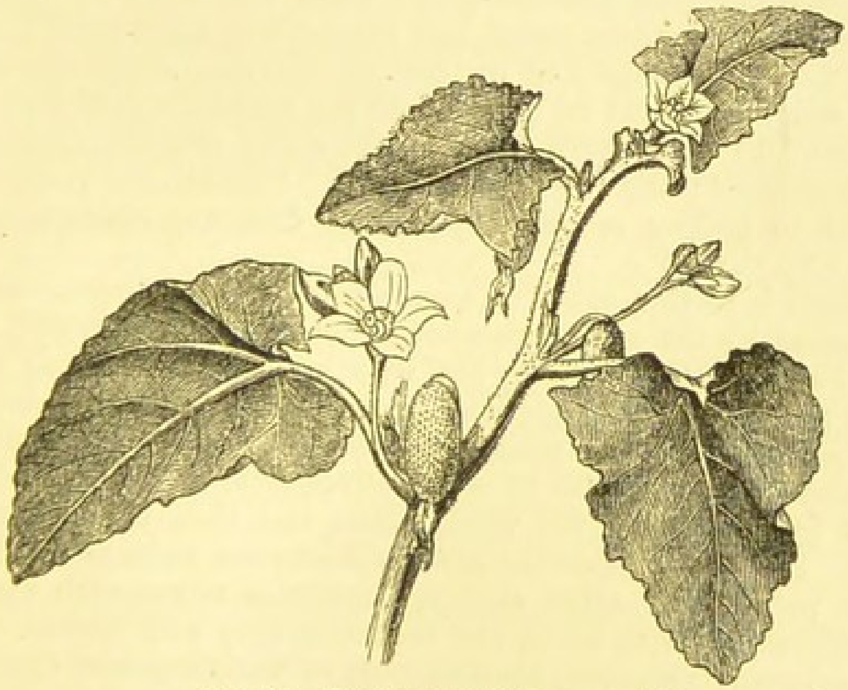

Fig. 69.—Ecbalium officinarum, *Rich.*

The Elaterium of the L. P. was the unripe fruit of this plant. Th

B. P. applies that name to the feculence deposited from the juice of the fruit, when separated and allowed to stand. This last is the *Extractum Elaterii* of the L. C. Dr Clutterbuck has proved that it is contained only in the juice around the seeds, which is of a gelatinous consistence. The rest of the fruit is comparatively inert. When the fruit is sliced and placed upon a sieve, a limpid and colourless juice flows out, which after a time becomes turbid, and then deposits a sediment. This, when dried, is light and pulverulent, of a light yellowish-white colour tinged with green, and is genuine Elaterium, of which Dr C. obtained only 6 grains from 40 of these Cucumbers; and found ⅛ of a grain to produce powerful cathartic effects.* The method now adopted for obtaining Elaterium is in conformity with these experiments. The fruit should be *just unripe*, because if only the *quite ripe* fruit is collected, the greater part of the active principle would in most cases be expelled by the peculiar method in which this plant discharges its seeds.

Prep.—Take of *Squirting Cucumber Fruit*, very nearly ripe, ℔j. Cut the fruit lengthwise, and lightly press out the juice. Strain it through a hair sieve; and set it aside to deposit. Carefully pour off the supernatant liquor; pour the sediment on a linen filter; and dry it on porous tiles with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way.†

Tests.—Colour pale greenish-grey: when exhausted by rectified Spirit, the solution concentrated, and poured into hot diluted Liquor Potassæ, there are deposited on cooling, minute, silky, colourless crystals, weighing about 26 per cent. of the Elaterium (not less than 20 per cent., B.) The Spirit dissolves the active principle (*Elaterin*) with Chlorophyll: the latter is retained. "Elaterium yields half its weight to boiling rectified Spirit. It does not effervesce with acids." (No chalk.)

Elaterium is in thin cakes of a pale-grey or greenish-grey colour, often marked by the substance upon which it has been dried; light and friable, with little odour, but with an acrid and bitter taste, which is possessed by other parts of the plant, as the leaves. An *inferior kind* is also met with, which is more compact, of a darker colour, and either brownish or of an olive-green. This is probably prepared by expressing the whole juice, and then evaporating to dryness. Dr Pereira describes *Maltese Elaterium* as in larger flakes, and of a pale colour, often chalky, sometimes mixed with Starch; hence effervescing with acids, and becoming blue with Iodine. Elaterium, carefully prepared, consists only of the feculence deposited when the juice has been exposed, in which some change is supposed to take place from the influence of the air. Alcohol is its best

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* At Hitchin and Mitcham, where Elaterium is cultivated, one bushel, or forty pounds of the fruits, has been found to yield about half-an-ounce of the extract.

† At the Mitcham gardens Elaterium is manufactured very much in the above way, only that considerable force is used in the expression of the juice, and the product therefore less potent, though more in quantity. The manufacture usually commences about the second week in September.

menstruum, dissolving from 50 to 60 per cent. of good Elaterium. It was first analysed by Dr Paris, who discovered an active principle which he named *Elatin.* This was found by Mr Morris of Edinburgh, and by the late Mr Hennell, to be composed of a peculiar principle, *Elaterin*, and of a green Resin. Elaterium also contains Bitter matter, Starch, Woody fibre, and Saline matters; but the proportion of Elaterin is very uncertain, varying from 5 to 44 per cent. in different specimens, probably according to the method of preparation and the goodness of the fruit. Elaterin may be obtained by the E. P. process for ascertaining the purity of Elaterium.

Dr Christison, who witnessed the experiments of Mr Morris Stirling, describes *Elaterin* as consisting of very delicate colourless, striated, satiny, prismatic crystals, with a rhombic base, permanent in the air, without odour, but of an intensely bitter and somewhat acrid taste. It fuses a little above 212°, and by a strong heat is decomposed with the evolution of ammoniacal smoke. It is soluble in rectified Spirit, Ether, fixed oils, and weak acids, but not in water or weak alkalies.

Action. Uses.—Powerful Hydragogue Cathartic; apt to create nausea and vomiting; in large doses will act as an irritant poison, producing inflammation of the intestinal canal. Useful in procuring copious watery evacuations in Dropsy, and as a revulsive in Cerebral affections.

Dose.—Good Elaterium will act effectively in doses of $\frac{1}{8}$ or even $\frac{1}{16}$ of a grain: it may be prescribed every other day with a bitter Extract. Common Elaterium is given in somewhat larger doses. *Elaterin* dissolved in Rectified Spirit may be given in $\frac{1}{16}$th grain doses.

UMBELLIFERÆ, *Juss.* Umbellifers. *Pentand. Digyn.* Linn.

The Umbelliferæ are allied to Araliaceæ and to Saxifrageæ, also to Ranunculaceæ, and likewise to Corneæ. They are natives chiefly of the northern parts of the northern hemisphere, but many of them exist in the Persian region and in the Himalayan mountains. Volatile Oil is the chief secretion of this family, and abounds most in the fruits, commonly called *seeds.* These are frequently employed as Carminatives. When the oil is diffused through the herbaceous parts, the plants are employed as culinary herbs. A Gum-resin exudes from some of them in the warm and dry Persian region, while others, growing chiefly in moist situations, are possessed of poisonous properties. These may be distinguished from the wholesome species by the absence of the aromatic odour. Their botanic characters are illustrated in fig. 70.

Tribe *Ammineæ.* Fruit laterally compressed or didymous.

CARUI FRUCTUS, B. Carum Carui, *Linn.* The fruit or *seeds* dried. Common Caraway. (Cultivated in England and Germany.)

Caraway was known to the Greeks, being a native of most parts of Europe.

Biennial, about 2 feet high. Root fusiform. Leaves bipinnate. Leaflets cut into linear segments. Involucre wanting, or of one leaf. Involucel none. Cal. obsolete. Pet. obcordate, with a narrow acute inflexed point. Fruit aromatic, oblong, a little curved, brownish-coloured. Carpels with 5 filiform ridges. Interstices with single vittæ.—Stylopodium depressed.—Meadows and pastures; cultivated in Essex. E. B. t. 395.

The fruits of the Caraway, or Seeds, as they are commonly called, have a pleasant odour and a warm aromatic taste, owing to the presence of about 5 per cent. of Volatile Oil, which may be dissolved out of them by Alcohol, or distilled off with water.

Action. Uses.—Stimulant Carminative, much used in Confectionery. Its Oil and Spirit (L. P.) used as Corrective Adjuncts, the water as a vehicle.

Oleum Carui, B. Oil of Caraway.

Obtained in England by distilling with *Aq.* the fruit of *Carum Carui.*

It is colourless or pale yellow, odour aromatic, and taste spicy.

Aqua Carui, B. Caraway water.

Prep.—B. Same as Aq. Anethi.

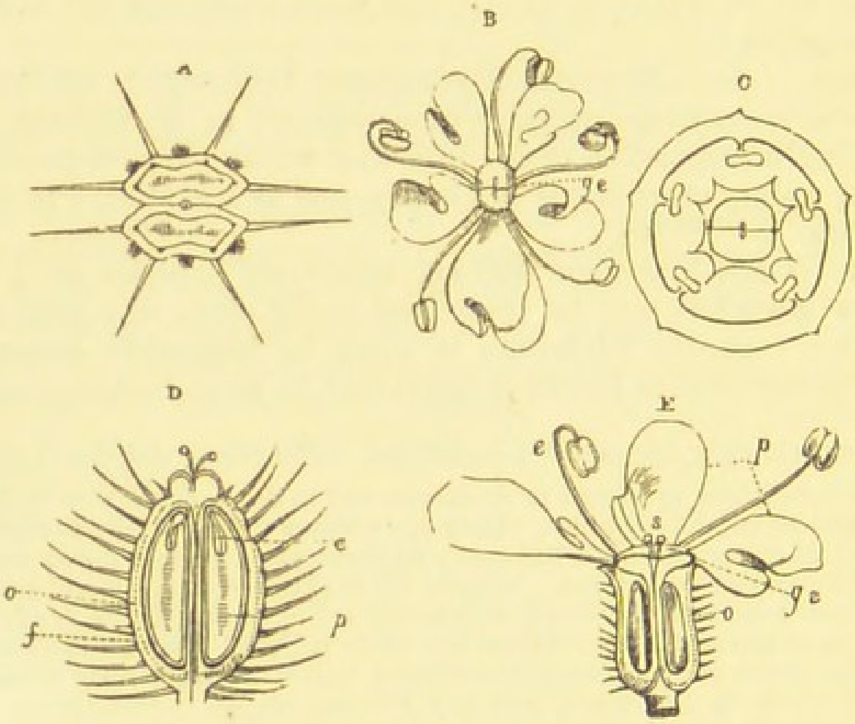

Fig. 70.

70. *Daucus carota.* c. Plan of the flower. b. Flowers seen from above. *g. e.* Disk. e. Vertical section of the flower. *p.* Petals. *e.* Stamens. *o.* Ovary adherent to the calyx. *s.* Styles and stigma. *g. e.* Disk. d. Vertical section of the fruit. *f.* Pericarp. *o.* Seed. *p.* Albumen. *e.* Embryo. a. Horizontal section of the fruit; primary ridges projecting into prickles, and alternating with the bristly secondary ridges.

Anisum. Pimpinella Anisum, *Linn.* Fruit. Anise.

Anise (ἄνισον), being a native of the Grecian Archipelago, was well known to the ancients.

Stem about a foot high, smooth. Radical leaves heart-shaped, rather roundish, lobed, incised; stem leaves biternate. Segments linear, lanceolate, rather wedge-shaped, acuminate. Umbels on long stalks, many-rayed, without involucres. Flowers small, white. Calyx obsolete. Petals obcordate, with an inflexed point. Fruit ovate, 1½ line long, covered with a few scattered hairs. Carpels with 5 filiform equal ridges. Interstices with 3 or more vittæ. Stylopodium tumid. Styles of the fruit recurved.—Nees and Eberm. 275.

The fruit, commonly called *Aniseed*, is ovoid, of a greenish-grey colour, and slightly downy ; the taste is warm, sweetish, and aromatic, the odour penetrating but agreeable, in both resembling the Star-anise (p. 290). It is cultivated in Malta and the south of Spain, and also in Germany. The kernel contains 3·5 per cent. of fixed oil, and the inner firmly-adhering seed-coat about 3 per cent. of *Volatile Oil of Anise*, on which its properties chiefly depend.

Action. Uses.—Agreeable Carminative, and much used for flavouring condiments.

Oleum Anisi, B. Oil of Anise.

Obtained by distillation with water from Aniseed ; it is of a bright yellow colour. It has the strong odour and taste of Anise. Much is imported from abroad ; but that which comes from China and the East Indies is produced by another plant, the *Illicium anisatum*, Linn., or *Star Anise* of the East. This is mentioned in the B. P. The oil solidifies very readily at 50°, from containing a large proportion of Stearoptene.

Action. Uses.—Stimulant Aromatic, Stomachic. In flatulent colic, in doses of ♏v.–♏xv.

Essentia Anisi, B. Essence of Anise.

Prep.—Take of *Oil of Anise*, f℥j. ; *Rectified Spirit*, f℥iv. Mix.

A strong preparation, 1 part in 5 of Oil, from D. P.

Dose.—♏x.–♏xx.

Tribe *Seselineæ*. Section of the fruit rounded or roundish.

Fœniculi Fructus, B. Fœniculum dulce, *Dec.* Sweet Fennel. The Fruit, or *seeds* (imported from Malta).

Fennel being found all over Europe, was known to the Greeks, and called *μάραθρον*.

The fruit of wild Fennel has a strong, rather disagreeable odour, and aromatic but acrid taste. Its properties depend upon a Volatile Oil of a pale yellow colour. The common Fennel (*F. officinale*) is not employed in medicine ; but as a decoction of Fennel *seeds* is sometimes employed as an Enema in the flatulent colic of children, those of the wild plant are well suited for this purpose. For internal exhibition, the Sweet Fennel is alone eligible. Some botanists consider this only as the cultivated variety of the *Fœniculum vulgare* ; but others account it a distinct species.

Fœniculium Dulce, *C. Bauh. Dec.*—Stem somewhat compressed at the base. Radical leaves somewhat distichous. Segments capillary, elongated. Umbels of 6 to 8 rays. (*Dec.*) This is, moreover, smaller than the wild plant, and an annual; but its fruit is much larger, some nearly 5 lines in length, less compressed, somewhat curved and paler, with a greenish tinge. A native of the south of Europe, cultivated in gardens as a pot-herb and for garnishing (*Finnochio dulce*, turionibus edulibus). Dr Pereira long since described the two kinds; the more agreeable taste and odour of this kind are, as he mentions, very decided. Care therefore must be taken in determining which kind of fruit is used in the following preparations.

Action. Uses.—Stimulant Carminative. Sometimes used in Flatulent Colic.

AQUA FŒNICULI, B. Fennel Water.

Prep.—B. As Aq. Anethi.

Action. Uses.—The Water of Fennel is employed occasionally in combination as an aromatic adjunct.

Tribe *Angeliceœ.* Fruit much and dorsally compressed, with a double wing on each side.

ANGELICA. Archangelica officinalis, *Hoffm.* Garden Angelica.

This plant has long been employed in medicine; but it is a doubtful native of this country.

A biennial plant. Root large, pungently aromatic. Stem 3 or 5 feet high, hollow, striated, rather glaucous. Foliage, stalks, and even flowers of a bright green. Leaves 2 or 3 feet wide, bipinnated or biternate. Leaflets ovate, lanceolate, sharply and closely serrated, all sessile, partly decurrent, terminal one trifid. Petioles much dilated at the base. Umbels terminal, globular, with dense secondary umbels. Involucre of 2 or 3 linear bracts, secondary one of about 8 linear-lanceolate bracts. Calyx minutely 5-toothed. Petals ovate, entire, acuminate, incurved. Fruit nucleated. Carpels or half-fruits with 3 dorsal thick-keeled ridges, and 2 marginal ridges dilated into broad wings. Interstices without vittæ. Seed free, with numerous vittæ.—Native of watery places in the northern parts of Europe.—E. B. t. 2561. Nees and Eberm. 279, 280.

The whole plant when bruised diffuses a strong and rather grateful odour. The root, when wounded in the spring, exudes an odorous yellow juice: when dried, the root is wrinkled, of a greyish-brown externally, and white in the inside: it has a warm and bitterish taste. The stem and leaf-stalks, cut in May, when they are tender, are made into a preserve with Sugar. The fruits have the same odour and taste, depending on the presence of a Volatile Oil and a Resin, as well as of a Bitter Extractive. The other ingredients of the root are Gum, Starch, water, and woody fibre. "The best way to preserve it is to pulverise it, and to pack the powder firmly in bottles. (*c.*)

Action. Uses.—Aromatic Stimulant, but little used; Stomachic. An infusion of the Root or Fruits (gr. cxx. to Aq. Oj.) may be given.

Tribe *Peucedaneœ.* Fruit much and dorsally compressed, with a single wing on each side, which is flat or thickened towards the edge.

ANETHI FRUCTUS, B. Anethum graveolens, *Linn.* The Fruit. Common Dill.

Dill (ἄνηθον), a native of the south of Europe and of the Oriental region, was well known to the ancients.

Annual, 1 to 2 feet high, every part smooth and glaucous, stem finely striated. Leaves tripinnated, with fine capillary segments like those of the Fennel, petioles broad and sheathing at the base. Umbels long-stalked, without general or partial involucres. Calyx margin obsolete. Petals varnished, yellow, roundish, entire, involute. Fruit lenticular flat, of a bright brown colour on the rather convex back, surrounded by a pale membranous margin. Carpels or half fruits with equidistant filiform ridges, the 3 dorsal acutely keeled, the 3 lateral more obsolete, and passing into the margin. Vittæ broad, solitary, filling the whole channels, 2 on the circumference.—Much cultivated in the East, and also in this country.—St. and Ch. iii. t. 137.

The flattened elliptical fruits, commonly called seeds of the Dill, with their brown and slightly convex backs and pale membranous margins, are easily distinguished from the other officinal fruits. Both the plant and the fruit are much used in the East as condiments and articles of diet. The plant is hence mentioned in the New Testament among the things tithed; but it is translated Anise. The carpels have a bitter but aromatic taste, owing to the presence of volatile oil which is stored up in the vittæ, making them useful as Carminatives. Dill is cultivated in England, and imported from middle and southern Europe.

OLEUM ANETHI, B. Oil of Dill.

Distilled in Britain from Dill fruit.

Colour pale yellow. Odour and taste aromatic.

Action. Uses.—Carminative in doses of ♏v.

AQUA ANETHI, B. Dill Water.

Prep.—B. Mix bruised *Dill* ℥xx. with *water* Cij. Distil Cj. (Or else, triturate briskly *Oil of Dill* fʒij, first with *powdered Flint* ʒij, then with *Dist. water* Cj, and filter through paper. L.)

Action. Uses.—Aromatic, given to infants to relieve Flatulence, and used as a vehicle for more active medicines.

The FŒTID GUM RESINS, as they are called, or *Opopanax, Assafœtida, Sagapenum, Galbanum,* and *Ammoniacum*, are all produced within the limits of the Persian region of botanists. Though the plants producing them are not accurately known, they are supposed mostly to belong to this tribe of Umbelliferæ; but *Galbanum officinale* belongs to Silerineæ.

OPOPANAX. A Gum-Resin.

Opopanax is described by Dioscorides as the produce of πάνακες Ἡράκλειον, a plant of Bœotia and Arcadia, which has been identified with the present *Opopanax Chironium*, referred by Sprengel to the genus Ferula. It is found also in the open fields of the south of France, of Italy, Sicily, and Greece, and, according to Merat and De Lens, also in Syria and the East. Dodoens first grew this plant from seeds found attached to pieces of Opopanax; and he states that when wounded in warm weather, especially near the root, a juice exudes, which concretes into a gum resembling Opopanax. But there is no proof that this plant yields the Opopanax of commerce, which reaches India either from the Persian Gulf or the coast of Arabia, and is called *juwa sheer*, or the milk of *juwa*, as it was by Serapion. Dr Lindley describes (Fl. Med. p. 100) the fruit of a species of Ferula, which he names *F. Hooshee*, and of which the produce (which, however, is not collected) is said to resemble the Opopanax, according to a letter from Mr Macneil. Opopanax is imported into this country from Turkey; in the time of Matthioli it was obtained from Alexandria.

Opopanax occurs in irregular-shaped but usually angular pieces of a reddish-yellow colour, sometimes speckled with white from the interior having become recently exposed; of a strong, rather fœtid odour, and of a bitter acrid taste. Sp. Gr. 1·62. It is composed chiefly of Resin and Gum, with 5·9 per cent. of Volatile Oil, which may be separated by distillation. It will form an emulsion with water.

Action. Uses.—Antispasmodic. It formerly enjoyed a high repute, as its name indicates, and was an ingredient of the Theriaca. It is not now officinal.

[SAGAPENUM, L. Planta incerta: Gummi-resina. Sagapenum.

Sagapenum, like Opopanax, has been known to us since the time of the Greeks. Dioscorides describes it as the produce of a Ferula growing in India, and we have no more recent information. It is the *sukbeenuj* of the Arabs, who gave *sagafioon* as its Greek name. It reaches India from the Persian Gulf or the coasts of Arabia. It is difficult by price-currents and commercial reports to distinguish the routes which small articles of commerce pursue. It is imported into Europe from the Levant, and also from Alexandria. It is probably a product of Persia. Willdenow was of opinion that it was produced by *Ferula persica*, which Olivier thought produced Ammoniacum, and Dr Hope that it yielded Assafœtida,—and which probably does yield some kind of fœtid Gum-Resin, as Michaux sent its seeds from Persia as those of Assafœtida. But it is preferable to leave this as a subject for investigation, than to stop inquiry by promulgating imperfect information.

Sagapenum is of a brownish-yellow or olive colour, chiefly in amygdaloidal masses, sometimes in tears: these are more or less transparent, soft, and of a waxy consistence. It has an alliaceous odour and acrid taste, similar to, but less powerful than that of Assafœtida. Pelletier found it to be composed chiefly of Resin and Gum, with about 11·8 per cent. of Volatile Oil; but Brandes found only 3·7 of the last.

Action. Uses.—Antispasmodic, but considered less powerful than Assafœtida. Given in doses of gr. v.–gr. xx.]

Omitted in the B. P.

ASSAFŒTIDA, B. Narthex Assafœtida, *Falconer.* (*Ferula*, Linn.) Gum-resin obtained by incision in the living root. (Affghanistan and the Punjaub, B.) Assafœtida.

Assafœtida, a product of Persia and Affghanistan, is mentioned in the ancient Sanscrit Amera Cosha. The ancients highly esteemed a gum-resin which the Romans called *Laser*, and the Greeks ὀπὸς Κυρηναϊκός, or the Cyrenaic Juice, from being produced in that country. The plant σίλφιον yielding it was an Umbellifer, and is represented on the coins of Cyrene. It has been discovered of late years, and named *Thapsia silphium*. This Laser had become scarce even in the time of Pliny, who, as well as Dioscorides, describes another kind as obtained from Persia, India, and Armenia, which was probably the same that was known to the Hindoos. Avicenna describes *hulteet* as of two kinds: one, of good odour, from Chiruana (Cyrene ?), and the other fœtid, the present *Assafœtida*. The term *assa* is no doubt of oriental origin, since it is applied to other gum-resins. Thus Benzoin is called *hussee-looban;* and used to be called *Assa dulcis* in old works. Dr Lindley has received the seeds of a Ferula called *hooshee*. *Anjedan*, the fruits or seeds (φύλλον of the Greeks), is usually translated *Laserpitium*. The plant is called *Angoozeh* by the Arabs. The root of *Silphion* is described by Arrian as affording food to herds of cattle on Paropamisus.

Assafœtida is produced in the dry southern provinces of Persia, as in the mountains of Fars and of Beloochistan, but chiefly in Khorassan and Affghanistan; likewise to the north of the Hindoo Khoosh range of mountains, where it was found by Burnes, and also in Wood's expedition to the Oxus. Dr Falconer found it in Astore, introduced the plant into the Saharunpore Botanic Garden, as mentioned in Dr Royle's "Productive Resources of India," p. 223, and has obtained from it a small quantity of Assafœtida. He sent home numerous seeds, which were distributed from the India House to several gardens. Assafœtida is now cultivated in Affghanistan and the Punjaub. It is conveyed on camels into India across the Punjaub and Bhawulpore, and is sold in large quantities at the Hudwar Fair. It is also conveyed down the Indus and by the Persian Gulf to Bombay.

Two or three kinds of Fruit, called Seeds, are met with, which are said to be those of the Assafœtida plant; but there is no proof that more than one plant yields Assafœtida. Dr Falconer, an excellent botanist, after examining the original specimens, considers the plant he saw in Astore to be the same as that figured by Kæmpfer; and Dr G. Grant, who saw the plant at Syghan, says, as stated by Dr Christison, that its roots, leaves, and flowering stem correspond on the whole with Kæmpfer's description, except that the root is deeply divided, like the outspread hand. But the root obtained later in Beloochistan by Dr Stocks is simple and tapering. The E. P. mentioned *Ferula persica* as probably yielding some Assafœtida. There is no doubt that its seed has been sent from the north-west of Persia as that of the Assafœtida plant; but there is no proof, nor indeed is it probable, that it yields any of the Assafœtida of commerce. The gum-resins of these Umbelliferæ are too similar to each other for any but experienced pharmacologists to determine between *inferior* Assafœtida and varieties of Sagapenum or other Gum-resins.

As Dr Falconer, Dr Royle's friend and successor as Superintendent of the East India Company's Botanic Garden at Saharunpore, had excellent opportunities for examining the Assafœtida plant, both in its native sites and as cultivated by himself, he favoured Dr Royle some years ago with the first full account of this important species, which he determined to belong to a genus allied to, but distinct from, Ferula.

NARTHEX (Falc. MSS.)

Calycis margo obsoletus. *Petala*—? *Stylopodium* plicato-urceolatum. *Styli* filiformes demum reflexi. *Fructus* a dorso plano-compressus margine dilatato cinctus. *Mericarpia* jugis primariis 5; 3 intermediis filiformibus, 2 lateralibus obsoletioribus, margini contiguis immersis. *Vittæ* in valleculis dorsalibus plerumque solitariæ (valleculis lateralibus nunc sesqui-vel bi-vittatis), commissurales 4–6 variæ inæquales, exterioribus sæpe reticulatim interruptis. *Semen* complanatum. *Carpophorum* bipartitum. *Umbellæ* pedunculatæ compositæ. *Involucrum* utrumque nullum.—Genus inter Peucedaneas, calycis margine edentato, fructus vittis magnis, commissuralibusque inæqualibus et involucro utroque nullo distinctum; Narthex nuncupatum, a vocabulo *νάρθηξ* apud Dioscoridem Ferulæ attributo.

Fig. 71.—NARTHEX. ASSAFŒTIDA. *Falc.* Plant grown in H. E. India Company's Botanic Gardens at Saharunpore.

N. Assafœtida (Falc.) Caule tereti simplici, petiolis dilatatis aphyllis instructo foliis radicalibus fasciculatis, petiolis trisectis, segmentis bipinnatisectis, laciniis lineari-lingulatis obtusis, inæqui-lateralibus integris vel variè sinuatis decurrentibus.—Assafœtida Disgunensis, Kæmpf. *Amœnit. Exot.* p. 535. Ferula Assafœtida. Linn. *Mater. Med.* p. 70. De Cand. *Prod.* iv. 173. Lindl. *Flor. Med.* p. 45. Fig. 69, 70, et 71.

Habit, in apricis inter saxa in valle "Astore" vel "Hussorah" dictâ prope Indum, ultra Cashmeer; indigenis Daradris "Sip" vel "Sup." Legi fructige-rum prope Boosthon 21° die Septembris, 1838.

Descrip.—A tall perennial plant, 5 to 8 feet high. *Root* fusiform, simple, or divided, a foot or upwards in length, about 3 inches in diameter at the top, with a dark greyish transversely corrugated surface; the summit invested above the soil with dark hair-like fibrous tegmenta, the persistent exuviæ of former years; cortical layer thick and tough, white or ash-coloured in the section, readily separable from the central core, and, like the latter, abounding in a white, milky, opaque, excessively fœtid, alliaceous juice. *Leaves* collected into a fascicle above the root, numerous, large, and spreading, about 18 inches in length in the adult plant, of a light-green colour above, paler underneath, and of a dry leathery texture; the petioles terete, amplexicaul, and channeled at the base, trifurcated a little above it, the divisions united at an angle with

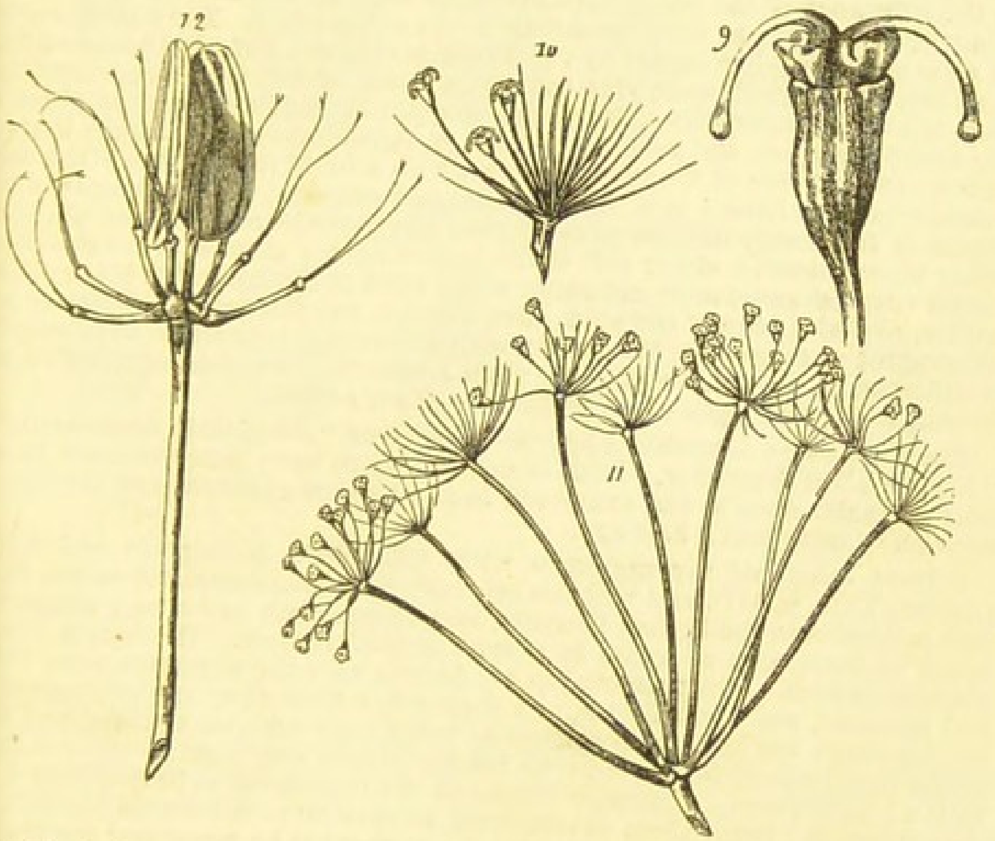

Fig. 72.—9. Ovary. Style and Stylopodium enlarged. 10. Partial Umbel, with rtile flowers. 11. Umbel of barren flowers. 12. Partial Umbel in fruit with rsistent Carpophores.

ch other, like the legs of a tripod, and bipinnately sected; the leaf-segments ear-lingulated, more or less obtuse, entire or sinuately lobed, variable in their set, being either alternate or opposite, for the most part unequal-sided, and current along the divisions of the petiole, forming a narrow winged channel on the latter. *Midrib* prominent on the under side, veins slender and anas-nosing by numerous reticulations. The leaves observed in a young growing nt (fig. 71) were about 9 inches in length, the leaf-segments being from 2 to 4 hes long by 4 to 6 lines in width. *Stem* erect, terete, simple, striated, about 2 hes in diameter at the base, solid throughout, the spongy medulla being tra-sed by scattered tough fibrous bundles of vessels, invested with alternate, ;inating, dilated, aphyllous petioles, and terminating in a luxuriant head of npound umbels. General as well as partial involucre entirely wanting. *Umbels*

10 to 20 rayed, immitted from the dilated spherical head of a common peduncle, the rays 2–4 inches in length. *Partial umbels* with very short rays aggregated into round capitula varying from 10 to 20 rays in the fertile, and from 25 to 30 in the barren umbellulæ. *Flowers* small; barren generally mixed up with the fertile flowers (?) Border of the *Calyx* obsolete, being reduced to very minute denticular points. (Petals in the barren flowers small, oblique, unequal-sided, acute, without an elongated acumen?) *Stylopodia* urceolate and plicated, with a sinuous margin. *Styles* filiform, reflected in the ripe fruit, rather short and slender, attached by a broad base. Fruit from 7 to 15, ripening on the partial umbels, supported on short stalks. *Mericarps* varying from broad elliptical to elliptical obovate, 5 to 6 lines long by 3 to 4 lines broad, flat, thin foliaceous, but somewhat convex in the middle, with a dilated border, generally unequal, sided, of a dark reddish-brown towards the centre, lighter towards the margin-perfectly smooth, with somewhat of a glossy surface. Dorsal primary ridges 5; the 3 middle ridges filiform, slightly crested towards their confluence at the apex; the lateral ridges more obsolete, situated close to the margin, immersed in the substance of the border, but distinctly seen on the surface of the commissure, and confluent with the middle nerve of the latter. The dilated border as wide as the space occupied by the 3 middle ridges. *Vittæ* in the dorsal furrows large and broad, occupying the entire width of the valleculæ, stretching from base to apex, usually solitary, but sometimes double in one or other of the middle furrows, and generally double or dichotomous, with a small branch, in the broadest side of the margin, turgid with a fœtid juice; vittæ of the commissure varying from 4 to 6, very unequal and variable; one very slender vitta, which is frequently dichotomous in two fine threads confluent at the apex, being placed close on either side of the middle nerve; another of the size of the dorsal vittæ, situated more outwards, and a third at the inner side of the dilated border, over the edge of the seed, more slender, but frequently subdivided and interrupted so as to cover the border with a beautiful network of anastomosing ramifications. *Seed* flattened, with plain albumen. *Carpophores* bipartite persistent, twice the length of the pedicles. *Flowers* white?

The plant above described I believe to be true "*Assafœtida disgunensis*," or "Hingiseh" of Kæmpfer. It does not appear to have been met with by any other botanist since it was examined *in situ* by that excellent and careful observer a century and a half ago.

I have compared my materials with Kæmpfer's description and figures (Amœn. Exot. p. 537), and with his original specimens contained in the Banksian collection in the British Museum, and found them, so far as a comparison could be instituted, to agree in every essential respect. The leaves "instar Pæoniæ ramosa" as represented in his figures, have the segments more obtuse and sinuated, and more alternate in their offset than they are represented in my drawing; but he describes them as being very variable in form, and some of the numerous leaf-specimens in his herbarium correspond with the figure which I have given. Kæmpfer mentions the umbellulæ as having only 5 or 6 rays, whereas I found them as numerous as 25 or 30 in the sterile capitula, and from 10 to 20 in the fertile ones. But he states that he never saw the plant in flower, and his description was probably drawn from the ripe state, in which the partial umbels occasionally present no more than 7 fruit-bearing stalks. There are two mericarps in his herbarium, of one of which I have given a representation (fig. 73, 5) agreeing exactly in form and in the development of the dorsal juga with those met with by me in the Astore plant; but Kæmpfer's specimens are glued down on paper, and they seem to have undergone some decay or alteration by which the vittæ have been emptied, so that their number and size cannot be distinctly made out. But they appear to be solitary in the dorsal valleculæ, and there is no indication of the numerous striæ represented in the figures of the fruit given in the Amœnitates, which may have confirmed authors in the belief that Kæmpfer's Assafœtida plant belonged to a species of Ferula. These mericarps are perfectly smooth, and exhibit nothing of the "quadatenus pilosum sive asperum," described in the Amœnitates, p. 538. Dr Lindley, in his Flora Medica, p. 45, after an abridgment of Kæmpfer's description, states (it is not mentioned upon what evidence), the vittæ of the back to be "about 20 or 22, interrupted, anastomosing, and turgid with Assafœtida: of the commissure 10." This account will apply to the fruit of a species of Ferula, but is entirely at variance with the characters presented by the fruits of the plants observed by Kæmpfer in Persia, and by myself in Astore.

Kæmpfer in his description says: "Folia sero autumno ex vertice progerminant, sex septem, et pro radicis magnitudine plura vel pauciora: quæ per brumam luxuriose vigent adultoque vere exarescunt." From the information which I gathered on the spot, confirmed by subsequent observation upon the growing plants introduced into the Botanic Garden at Saharunpore, the leaves of the Astore Assafœtida plant make their appearance in spring, and not in autumn, surviving through the winter, as stated by Kæmpfer respecting the Persian form. With these slight discrepancies, his description might serve for the Astore plant.

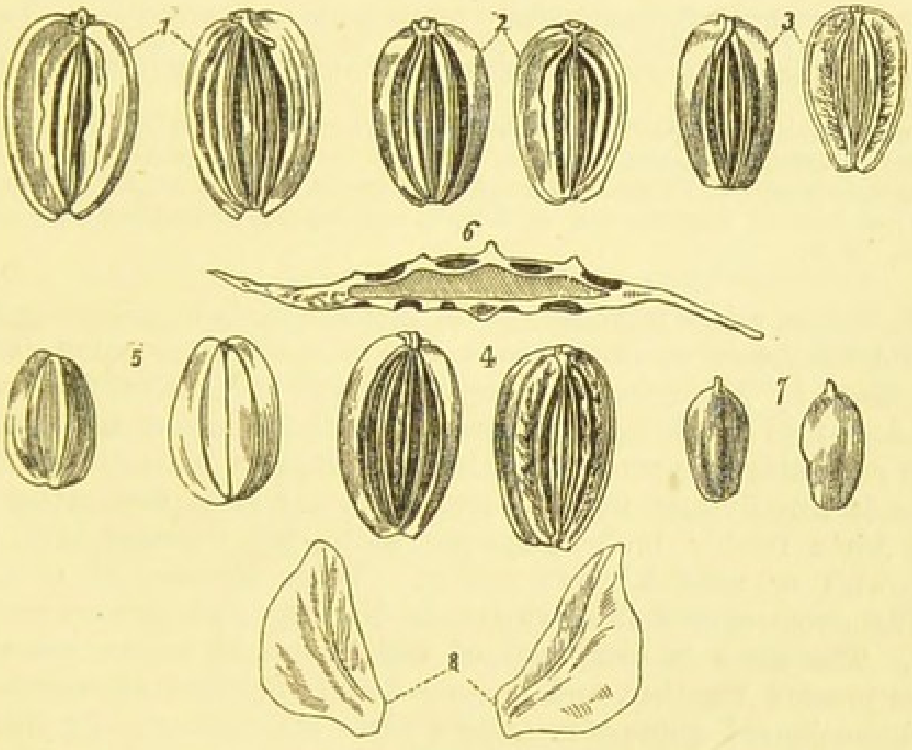

Fig. 73.—1-4. Mericarps of the natural size. (*a.*) Dorsum. (*b.*) Commissure. 5. Mericarps in Kæmpfer's Herbarium, dorsal aspect. 6. Transverse section of Mericarp enlarged. 7. Seed, natural size. 8. Two Petals of a barren flower enlarged.

Narthex, both in the characters of the flowers and fruit, and in its "Pæony-leaved" habit, differs widely from any known species of Ferula, and appears to constitute a distinct and well-marked genus.

In the Dardoh or Dangree language (the Dardhos being the Daradi of Arrian) the plant is called "Sip" or "Sup." The young shoots of the stem in spring are prized as an excellent and delicate vegetable.

The species would appear to occur in the greatest abundance in the provinces of Khorassan and Laar in Persia, and thence to extend on the one hand into the plains of Toorkestan on the Oxus north of the Hindoo Khoosh mountains, where it seems to have been met with by Sir Alex. Burnes,* and on the other to stretch across from Beloochistan, through Candahar and other provinces of Affghanistan to the eastern side of the valley of the Indus, where it stops in

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* Burnes mentions the plant as an annual, probably in consequence of the annual decay of the stems. He states that sheep browse on the young shoots.

Astore, and does not occur in great abundance. The whole of this region, which constitutes the head-quarters of the gum-bearing Umbelliferæ, possesses the common character of an excessively dry climate, indicated in Berghaus's hygrometric map in Johnston's Physical Atlas by a belt of white.

Besides the gum-resin, the fruit of *Narthex Assafœtida* is imported into India from Persia and Affghanistan, under the name of "Anjoodan," being extensively employed by the native physicians in India: "Anjoodan" being the epithet applied to the seed of the "Heengseh," or "Hulteet," by Avicenna, also quoted by Kæmpfer, and used by the Indo-Persian and Arabic writers generally in describing the Assafœtida plant. Another umbelliferous fruit is also imported with it, and sold under the name of "Dooqoo" (a word evidently connected with the *δαῦκος* of the Greek), being recommended as an excellent substitute for "Anjoodan," which it closely resembles in its general appearance. This I found to be the fruit of a species of true Ferula; it is one of the two Assafœtida-like fruits mentioned by Dr Royle as occurring in the bazaars of Northern India. The species of Ferula yielding this fruit may furnish some one of the obscurely-known gum-resins resembling Assafœtida produced in Persia.

I have examined another kind of umbelliferous fruit in the collection of Dr Royle, labelled as "the seed of the wild Assafœtida plant collected and brought to England by Sir J. Macneil from Persia," which differs widely from the fruit both of Narthex and of Ferula, and belongs to another tribe of the order. H. F.

M. Buhse, a late traveller, states that the mode of collecting Assafœtida in Persia at the present day is exactly the same as that described by Kæmpfer 160 years ago. It is obtained by making incisions into or taking successive slices off the top of the root, and then collecting the produce, which is united in masses, and in this state is usually met with in commerce. It is at first rather soft, and when freshly broken, opaque white, but becomes hard, of a yellowish or reddish-brown colour. When broken, an irregular, whitish, somewhat shining surface is displayed, which soon becomes red. The mass is composed of various-shaped pieces, some like tears pressed together, and in some parts agglutinated together by darker-coloured gum-resin. Some parts are cellular. By thus becoming red on exposure to the air, and its intolerable alliaceous odour, Assafœtida may be readily distinguished. The taste is garlicky, bitter, and acrid. It is best preserved covered by bladder. It is powdered with difficulty, even when become hard; softens by heat, and burns with a clear flame. Assafœtida is composed of Resin 65 parts, Volatile Oil 3·6, Gum 19·44, Bassorin 11·66, Salts 0·30 (*Pelletier*). Brandes obtained less Resin, Volatile Oil 4·6, and 10·5 of various salts and impurities. The Oil is at first colourless, but becomes yellowish-brown, has an exceedingly offensive odour, a bitter and acrid taste, and contains some Sulphur. The formula has been determined by M. Hlasiwetz to be $C_{24}\,H_{22}\,S_3$, but on long exposure it becomes altered in composition. Water will dissolve the Gum, and form an emulsion with the other ingredients. Alcohol or Rectified Spirit is a good solvent. "It dissolves almost entirely in rectified spirit." (B.) An emulsion is formed when the solution is added to water. Ether dissolves the Oil and all the Resin, except about 2 per cent. of a peculiar kind. Ammonia also takes up the active ingredients.

Action. Uses.—Stimulant, Antispasmodic; thought to be Emmenagogue and Anthelmintic. Much used as a condiment in the East. Useful in Spasmodic and Convulsive diseases, as Hysteria and Chorea, also in Hooping Cough, Flatulent Colic, and in Chronic Cough.

Dose.—Gr. v.–gr. xx., in pill or in some of its compounds, every 3 or 4 hours. The Emulsion acts quickly, and may be formed readily by adding the Tincture to Aqua Fœniculi.

Tinctura Assafœtidæ, B. Tincture of Assafœtida.

Prep.—Macerate *Assafœtida* broken in small fragments ℥ijß in *Rectified Spirit* ℥xv. for seven days, strain, and add *Rect. Spirit* to make Oj.

Action. Uses.—Antispasmodic. Prescribed in Hysterical cases, &c., as Spir. Ammoniæ fœtidus (p. 67), in doses of fʒj.–fʒij.

Enema Assafœtidæ, B. Enema of Assafœtida.

Prep.—B. Rub *Assafœtida* gr. xxx. in a mortar with ℥iv. of *Dist. water*, added gradually, so as to form an emulsion. (B. 1864.—Mix *Tincture of Assafœtida* fʒvj. with *Mucilage of Starch* ℥vj.)

Pilula Assafœtidæ Composita, B. Compound Assafœtida Pill.

Prep.—Heat *Assafœtida*, *Galbanum*, and *Myrrh*, of each ℥ij., *Treacle*, by weight, ℥j. in a water bath, and stir the mass till it assumes a uniform consistence. (Resembles *Pil. Galbani Comp.*, L.)

Action.—Antispasmodic.

Dose.—Gr. v.–gr. xx.

Off. Prep.—Pil. Aloes et Assafœtidæ, B. Spir. Ammoniæ Fœtidus, B. [Pilula Galbani Comp. L.]

Ammoniacum, B. Dorema Ammoniacum, *Don.* Gum resinous exudation. (Persia and the Punjaub.) Ammoniacum. Gum Ammoniac.

Ammoniacum is described by Dioscorides, 3, c. 88 (or 98) as the produce of a plant called *Agasyllis*, *Metopium* of Pliny, which grows in Cyrenaic Africa near the temple of Jupiter Ammon, whence it derives its name. Mr Don supposed this to be a corruption of Armoniacum: it is so written in some old books. Jackson, in his account of Morocco, states that the Ammoniacum plant, which he calls *Feshook*, grows in Morocco, near Al-Araish. The Hon. Fox Strangways favoured Dr Lindley as well as Dr Royle with the fruit of a *Ferula* which was marked as that of *Fusogh*, or Gum Ammoniac, obtained by him from Tangier. Some of these were sent to Dr Falconer, by whom they were grown in the Saharunpore Botanic Garden, and the plant found to be identical with the *Ferula Tingitana*. Dr Lindley had previously determined the fruit to be that of the same plant. In his Flora Medica he refers the *Feshook* of Jackson, t. 7. to *F. orientalis*, with a query. But the gum of this species, as obtained by Dr Stocks in Scinde, is wholly unlike any product known in English commerce. Willdenow concluded erroneously that Ammoniac was produced by *Heracleum gummiferum*.

The Ammoniacum of commerce of the present day is for the most part a product of Persia, and obtained from Bombay, having been previously imported there from the Persian Gulf, whence probably a portion is also carried up the Red Sea, and thus reaches Europe by the Levant. Captain Hart (Trans. Med. Soc. of Calcutta, i. p. 369) found the plant in the plains between Yezed-khast and Kumisha, on the road from Shiraz to Ispahan, or on the border of the provinces of Fars and of Irak Ajemi. Lieut.-Colonel Johnston saw the plants growing at Mayer and Yezde-Khast, and collected specimens of the plant with its fruit and gum. Lieut.-Colonel Wright obtained specimens at the same place, which he gave to the Linnean Society, and which Mr Don described. This was the *Dorema Ammoniacum*. M. Fontanier (Merat and De Lens, i. p. 25) also obtained it at Yezd-Cast in Faristan, which appears to be the same place. Major Willock informed Dr Royle that the *ooshak* plant was only to be met with in the province of Irak, in dry gravelly plains, where it is exposed to an ardent sun. Sir John M'Neil found it on the low hills near Herat, and Dr Grant at Syghan, to the north of Bamean, where the same dry climate prevails. In the same kind of country, but more to the eastward, many other Umbelliferæ were found by Dr Falconer, together with *Narthex Assafœtida* and *Prangos pabularia*.*

A late traveller, M. Buhse, saw the Ammoniacum plant in Persia, growing near a village to the south of Damgam, and more than 3000 feet above the level of the sea. He states that it was called by the natives *weshach*, and he concluded it to be *Dorema Aucheri*, but he saw only the leaves, which were probably those of *D. Ammoniacum*. The gum may, however, be yielded also by other allied species. The resin of *Dorema aureum* collected by Dr Stocks in Beloochistan, strongly resembles the Ammoniacum of commerce. M. Fontanier says Gum Ammoniac exudes naturally at the axils of the umbel and upon the tumid apices of the peduncles.

Root large, perennial. Stems 7 to 9 feet high, about 4 inches in circumference at the base, clothed with glandular down (*Don*), smooth (*Fontanier*), glaucous, with the habit of *Opopanax Chironium*. Leaves large, petiolate, somewhat bipinnate, 2 feet long; pinnæ usually 3 pairs, each pair rather remote: lower leaflets distinct; superior ones confluent, deeply pinnatifid; segments oblong, mucronate, quite entire, or rarely a little lobed, coriaceous, veined beneath, 1-5 inches long, and ½ to 2 inches broad. Petiole ribbed, pubescent, much dilated, and sheathing at the base. Umbels proliferous, racemose, partial umbels globose, on short peduncles, usually disposed in a spicate

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* The energetic traveller Aucher-Eloy visited the same localities, one of them Yezdikhast, and obtained fragments of a plant which has been named *Disernestum gummiferum* by Jaubert and Spach, in Illustr. Pl. Orient, who state that it is allied to Siler and to Agasyllis, and is hence placed in the tribe *Silerideæ*, v. Walper's Repert. ii. p. 939. It appeared to Dr Royle to be only the above *Dorema Ammoniacum* described from imperfect specimens. Plant of considerable height, finely hairy when young, but becomes smooth with age. The inferior leaves are very large, doubly compound. Partial umbels sessile or pedunculated on a leafless panicle, with the gum-resin collected especially in the axils of the partial umbels. Petals white. Disk cup-shaped, crenate, plicate. Fruit oval, compressed dorsally with narrow wings. Mericarps with 6 or 9 ribbed ridges, and vittæ delicate and fine.

manner. Neither general nor partial involucre. Peduncles terete, woolly. Flowers sessile, immersed in wool. (*Lindley.*) Margin of calyx 5-toothed, teeth acute membranous. Petals white, ovate, with an inflexed point. Disk large, fleshy, cup-shaped, with a plicate, rather lobulate margin. Stamens and styles yellow, the latter complanate, recurved at the apex. Stigmas truncate. Ovary densely woolly. Fruit elliptic, compressed from the back, surrounded by a broad flat edging. Mericarps with 3 distinct filiform ridges near the middle, and alternating with them 4 obtuse secondary ridges (two of the primary ridges confluent with the margins). Vittæ 1 to each secondary ridge, 1 to each primary marginal ridge, and 4 to the commissure, of which 2 (the exterior ones) are very small.—*Don and Lindley.*

As the plant abounds in juice, this readily exudes on the slightest puncture: M. Fontanier says, spontaneously. Captain Hart states that when the plants have attained perfection, or about the middle of June, innumerable beetles pierce it in all directions. The juice soon becomes dry, and is picked off. The finest pieces being kept separate, form the *Ammoniacum in tears* of commerce, which vary in size, are yellowish externally, and of a white, opaline, or waxy appearance when fractured. These, when pressed together, form lump or Amygdaloid Ammoniacum, in which the tears appear agglutinated together by a softer material, often mixed with some of a darker colour. In the inferior kinds the tears are less abundant, and impurities, as sand, fruit of the plant, &c., are intermixed.

Ammoniac is rather hard, but readily softens by heat, has a powerful and peculiar smell, and bitter and acrid taste. Sp. Gr. 1·207. It consists, according to Bucholz, of 22·4 parts of Gum, 72 of Resin, 1·6 of Bassorin (Gluten ?), and 4 of Volatile Oil. Much less Oil has been obtained by other chemists, and by some none at all. Ammoniac forms an emulsion with water. Alcohol dissolves its Resin and Oil, but the tincture becomes milky on the addition of water.

Action. Uses.—Stimulant Expectorant. Antispasmodic, chiefly in chronic Catarrhs.

Dose.—Gr. v.–gr. xx. Usually taken with Squill or in Emulsion.

MISTURA AMMONIACI, B. Ammoniac Mixture or Emulsion.

Prep.—Triturate *Ammoniacum*, in coarse powder, ℥½, with *Aq. dest.* ℥viij. added gradually, till the mixture assumes a milky appearance, then strain through muslin.

Action. Uses.—Water dissolves the Gum, and thus suspends the Resin of the Ammoniac, when an Emulsion is formed. The addition of a little Vinegar assists in making it smoother. Stimulant Expectorant in chronic Catarrhs, &c., in doses of f℥ß–f℥jß.

[EMPLASTRUM AMMONIACI, L. Ammoniac Plaster.

Prep.—L. Liquify *Prepared Ammoniacum* ℥v. in *Acet. acid* f℥viij.; then evaporate, constantly stirring, over a slow fire, to a proper consistence.

The vinegar does not dissolve, but softens the Gum-resin, which may then be applied as a poultice, and forms an adhesive stimulant and resolvent plaster; often of use when applied to indolent swellings.]

Off. Prep.—Pilula Scillæ Comp., B. Pil. Ipecac. c. Scillâ, B.

Emplastrum Ammoniaci cum Hydrargyro, B. (*See* p. 218.) Emp. Galbani, B.

GALBANUM, B. Gum-Resin, from an unascertained unbelliferous plant. Galbanum. (India and the Levant.)

Galbanum is supposed to be the same substance as the *Chelbenah* of Scripture (*see* Cycl. of Biblical Lit.), as this word is very similar to the χαλβάνη of the Greeks, a substance known to Hippocrates, and described by Dioscorides, who gives μετώπιον as an additional name. Theophrastus has long previously stated that it was the produce of a *Panax*, Dioscorides of a *Ferula* of Syria. But the word *Syria* had a wide geographical signification in ancient times. Arabic and Persian authors seem to have been well acquainted with the plant, as they give *kinneh* and *nafeel* as its names, and *barzud* as that of the gum-resin. D'Herbelot states that this is the same as the *pirzed* of the Persians, who call the plant yielding it *giarkhust.* Whatever the plant may be, it is as yet unknown to botanists. Lobel attempted to ascertain it by sowing some of the seeds which he found attached to Galbanum, and obtained *Ferula Ferulago*, a native of North Africa and of Asia Minor, but which is not known to yield Galbanum; while *Bubon galbaniferum*, which is sometimes adduced, is a native of the Cape of Good Hope. The late Professor Don having found some seeds sticking to Galbanum, named the plant yielding them, though yet unknown, *Galbanum officinale*, belonging to the tribe *Silerinæ*, which was admitted (with a query) in the L. P. But these fruits may, or may not, be those of the Galbanum plant. Dr Lindley has, in consequence, suggested another plant, of which he received the fruits from Sir John Macneil. This grows at Durrood, near Nishapore, in Khorassan, and yields a gum-resin of which a specimen seen by Dr Pereira did not correspond with any known gum-resin. Dr Royle had several such in his collection. Dr Lindley has named the plant *Opoidea galbanifera*, tribe Smyrneæ.

The most recent and perhaps the most credible information on this much-contested point is derived from the personal inquiries made by M. Buhse in his Persian travels. He tells us that he found the plant from which Galbanum is prepared growing on the declivities of the Demawend mountains. He considers it all but identical with *Ferula erubescens*, but it differed from that plant in the absence of the commissural vittæ of the fruit. He is certain that it belongs neither to the genus *Galbanum* nor to *Opoidea.* The natives called the plant *Khassuch.* (Some consider the Galbanum of Persia to be so distinct from that commonly obtained from the Levant, that it must be the product of a different plant.)

Galbanum is imported from India and the Levant, having probably been brought down the Persian Gulf. It is usually met with in masses of a brownish-yellow colour, more or less translucent and shining; sometimes in small tears, which are of a paler or even yellowish colour. In the former kind, the tears are reddish-yellow, often agglutinated together by a darker-coloured substance, and mixed with pieces of the stalk, fruits, sand, &c. It is soft, can only be powdered in cold weather, has a bitter and even acrid taste, with a peculiar but not alliaceous odour. It consists of Resin 65·8, Gum 22·6, Bassorin 1·8, Volatile oil 3·3, with a trace of Malic acid, &c. Its properties depend chiefly upon the Oil, which may be separated, of a yellowish colour, by distilling with water. When Galbanum is distilled by itself at a temperature of 250° F. a bluish-coloured oil is obtained. Galbanum forms an emulsion with water, and is dissolved by Proof Spirit.

Action. Uses.—Antispasmodic; less powerful than Assafœtida; Expectorant.

Dose.—Gr. x.–gr. xx. in substance, or made into an emulsion.

[PILULA GALBANI COMPOSITA, L. Compound Galbanum Pill.

Prep.—Take of *Prepared Galbanum*, ʒij.; *Myrrh* and *Prepared Sagapenum*, āā ʒiij.; *Prepared Assafœtida*, ʒj.; *Soft Soap*, ʒij.; and *Treacle*, q. s. Beat all together that a mass may be formed.

Action. Uses.—Antispasmodic. Emmenagogue in doses of gr. x.–gr. xx.]

EMPLASTRUM GALBANI, B. Galbanum Plaster.

Prep.—B. *Lead Plaster* ℥viij. with *Ammoniac*, *Galbanum*, and *Yellow wax* āā ℥j.

Action. Uses.—Stimulant and Discutient application to indolent tumours, &c.

Pharm. Prep.—Pil. Assafœtidæ Comp., B.

Tribe *Daucineæ*. Fruit dorsally sub-compressed or round. Carpels with 5 primary ridges, the lateral ones on the inner face; and 4 secondary ridges forming rows of prickles.

[CAROTA, L. Daucus Carota, *Linn.* (*var.* sativa.) Radix recens; the fresh root. Root of the Cultivated Carrot.

The Carrot has long been cultivated in the East, where it is called *jugar* and *gajur*. The Arabs give *istufleen* as its Greek name—a corruption, no doubt, of the σταφυλῖνος of Dioscorides.

Stems 2 to 3 feet high, hispid. Leaves tripinnate; leaflets of the upper leaves linear, lanceolate, acute, of the lower leaves broader; leaflets of the general involucre pinnatifid, with linear segments, or the partial one linear, entire, or trifid. Calyx (fig. 70 *c.*) 5-toothed. Petals white, except in a central neutral flower, which is red, as mentioned by Dioscorides, obcordate (D.) with an inflexed lobe, exterior usually radiant and bifid. The umbels, at first flat, become afterwards hollow, from the incurvature of the pedicles. Fruit dorsally (A.) compressed. Carpels with bristly primary (A.D.) ridges; secondary ridges winged, the wings divided often to the base into a row of simple prickles, which are equal in length to the diameter of the fruit. Common on roadsides and in pastures throughout Europe and the Oriental Region. Fig. 70, p. 458, a section of the flower and fruit from Adr. Juss, with the several references. E. B. 1174.

The root of the cultivated carrot is too well known from its fusiform shape, yellow colour, sweetish taste, and nutritious nature, to require description. It is officinal, on account of its succulent nature being favourable for making poultices, which are moderately stimulant.

The *wild variety* has fusiform roots, which are small, yellowish, and woody, with a bitter and acrid taste, but with the peculiar odour of the Carrot. The fruits, commonly called seeds, have this odour in a more marked degree, from their natural mode of growth being best suited for the development of the peculiar secretions of the plant. The Volatile oil, which is secreted especially in the fruit, is diffused in less quantity over the whole plant, and even in the cultivated root. The fruits were, until lately, officinal.

Action. Uses.—Demulcent. Used to make poultices.]

Tribe *Cumineœ.* Fruit compressed laterally, ridges all apterous.

[CYMINUM, L. Cuminum Cyminum, *Linn.* Fructus, the Fruit, Common Cumin.

Cumin (*kumoon* of the Arabs) is probably a native of Asia, and was made known to the Greeks from Egypt. It is extensively cultivated in the East, but has long been introduced into the south of Europe. England is chiefly supplied from Sicily and Malta.

Cumin is an annual, from 1 to 2 feet high, with much-divided leaves, having the segments long and setaceous. The umbels, both general and partial, from 3–5 rayed, with involucres, of 2–4 simple or divided leaves. Involucels halved, of 2–4 leaves, finally reflexed, and exceeding in length the pubescent fruit. Flowers white or pink. Calyx with 5 lanceolate, setaceous, permanent teeth. Petals oblong, emarginate, with an inflexed point. Fruit contracted from the sides. Mericarps with wingless ribs, the 5 primary ones minutely muricated; 4 secondary ones prickly. Channels oblong, striated, minutely aculeate under the secondary ridges, with 1 vitta in each. Seed somewhat concave in front, and convex on the back.—Esenb. and Eberm. 288.

Cumin seeds, or rather fruits, are of a light-brown colour. The odour is aromatic, dependent on the Volatile oil which is stored up in the seed-coat. Taste warm, bitterish, and aromatic, but not so agreeable as Anise. The albumen is insipid. 16 cwt. of the fruits yield about 44℔ of the oil, which has a Sp. Gr. 0·945, pale-yellow colour, and is limpid, of a disagreeable smell and acrid taste.

Action. Uses.—Stimulant Carminative. Condiment in India. Seldom used in medicine.

Dose.—Gr. xv.–gr. xxx.

EMPLASTRUM CUMINI, L. Cumin plaster.

Prep.—Melt together *prepared Burgundy Pitch* ℔iij. and *Wax* ℥iij., then add *Olive Oil* and *Water* āā f℥jß, with *Cumin*, *Caraway*, and *Bay-berries* āā ℥iij., first reduced to powder. Evaporate to a proper consistence.

Uses.—Stimulant to indolent sores and tumours.]

Tribe *Smyrneæ.* Fruit turgid, compressed laterally. Carpels with primary ridges only.

Conii Folia, B. Conium maculatum, *Linn.* Spotted Hemlock. The fresh Leaves and young Branches, also the Leaves dried (gathered from wild British plants when the fruit begins to form).

Conii Fructus, B. The ripe Fruit, dried.

There is little doubt of this being the *κώνειον* of the Greeks, and the *cicuta*[*] of the Romans, as has long been supposed, and has been vell argued by Dr Pereira. The objection that it is not so clearly escribed as to be readily distinguished from other Umbelliferæ, vould apply to accounts of many officinal plants, even in comparaively modern works. It is the *shokran* of the Arabs, who give *huniun* and *kunion* as its Greek name, and give *bunj-roomee*, or

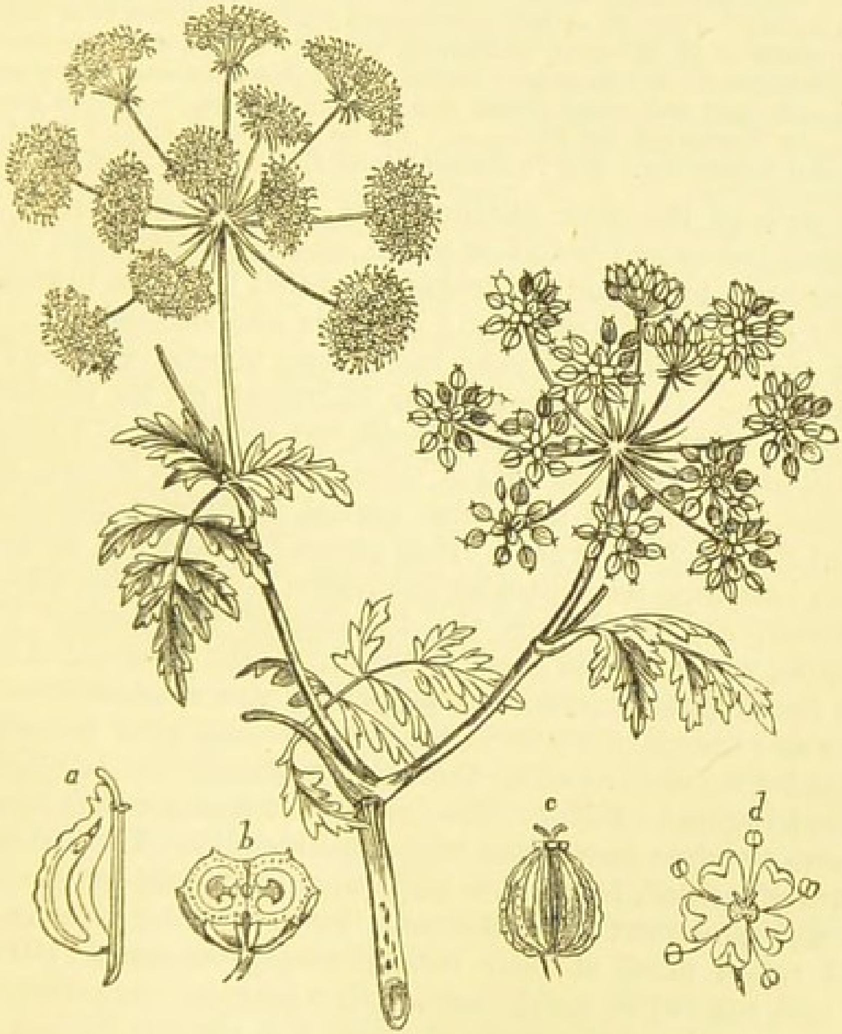

Fig. 74.—*Conium maculatum.* *d.* Flower. *c.* Fruit. *b.* Transverse— and *a*, vertical section of fruit.

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[*] This must not, from the similarity of name, be confounded with *Cicuta aculata. Cicuta virosa* occurs in Cashmere, where it is called *Zehr-googul*, or oison-turnip. Persian, *Salep-e-Shaitan*, or Devil's Salep.

Turkish *bunj*, as another name. The name *bunj* is applied to Henbane, while Datura is *bunj-dushtee.* It was reintroduced into practice by Störck.

Root biennial, fusiform, whitish, a little fleshy. Stems 2 to 5 feet high, erect, round, smooth, spotted with dull-coloured purple spots. Leaves large, shining, of a deep-green colour, tripinnate, on long furrowed petioles, sheathing at the base. Leaflets lanceolate, pinnatifid, with the lower lobes incised, the others toothed. Umbels numerous, terminal, composed of many general as well as partial rays. General involucre of from 3 to 7 leaflets, ovate, cuspidate with membranous edges, partial involucre of 3 leaflets on one side ovate lanceolate, shorter than the umbels. Margin (*c*) of calyx obsolete. Petals 5 (*d*), white, obcordate with inflexed apices. Stamens (*d*) 5. Ovary ovate, 2-celled. Styles (*c*) 2, spreading. Fruit (*c*) ovate, compressed laterally. Carpels or half fruits with 5 prominent (*c*, *b*), equal, undulated, primary ridges, of which the lateral ones are marginal. No secondary ridges. The channels with many striæ but no vittæ.—Hedges and waste places throughout Europe; found in Greece by Sibthorp, in Cashmere by Falconer. Fl. in June and July Fruit ripe in August and September. Fig 74.—Esenb. and Ebeim. 282; St. and Ch. 13.

The parts of Hemlock distinguished for use, as Conii Folia, are "the fresh leaves and branches of the wild plant, gathered when the fruit begins to form, and the leaves separated from the branches and carefully dried." The ripe fruit, dried, is also officinal.

This plant in its first year has a long slender root and a few radical leaves. In the second year it throws up its characteristic and spotted stem, on all parts smooth, but possessed of a strong and fœtid odour, compared to that of mice. It may be known by these characters, and by its unilateral partial involucres and the wavy crenated ridges of the fruit.* It is generally stated, as in the B. P., that the best time for collecting the leaves is when the plant is in full flower, or just before the forming of the fruit. This Dr Christison, who has paid great attention to the subject, doubts, as he has found that its poisonous properties are considerable in November and March of its first year. And some have recommended that the leaves used to make the extract should be gathered when the plant begins to flower. The fruit is more active than the leaves, and more so when green than when ripe and dry. The leaves should be carefully dried, in a dark airy room, at a temperature of about 120°, and preserved in well-closed, dark, and dry vessels. They should retain much of their natural deep-green colour, have a nauseous and somewhat acrid taste, with a peculiar mouse-like odour. This should be readily evolved when the plant is rubbed up with caustic Potash.

Several analyses have been made of Conium. Giseke in 1827 succeeded in concentrating its active principle with Sulphuric. Geiger in 1831 detached it in the form of a volatile and oleaginous alkali, possessed of powerful poisonous properties. The experiments

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* This plant should be distinguished from *Æthusa Cynapium*, or Fool's Parsley, and also from *Anthriscus vulgaris* and *sylvaticus*, as well as *Myrrhis odorata* and *temulenta.* The other poisonous umbellifers are the above *Æthusa Cynapium*, Fool's Parsley; *Cicuta virosa*, Water Hemlock; *Œnanthe crocata*, Hemlock Water Dropwort; *Œnanthe apiifolia*, which is probably only a variety of *Œ. crocata.*

of Geiger have been confirmed by Dr Christison. Both find that the distilled water, though having the peculiar odour of Hemlock owing to the presence of its Volatile oil, is yet not poisonous; but that if the full-grown green fruits or leaves be distilled with water and caustic Potash, a strongly *alkaline* and poisonous *liquid* passes over, which is *Conia.* This has been found in the fruit and leaves, and exists in them as a salt, thought its acid is unknown. It may be detached by presenting an acid, as the Sul′, which combines with the Conia; when this, by the action of Potash, may be separated from the acid, and distilled over with water at 212°. *Conia* is a colourless and transparent oily-looking body, lighter than water, having a powerful mouse-like odour, and a very acrid taste. It is strongly alkaline. Water takes up but little of it, but with a fourth of its weight it forms a Hydrate of Conia. Alcohol and Ether dissolve it readily; so do diluted acids, which combine with it. Its vapour produces white fumes with the vapour of $H\,Cl$, Hydrochlorate of Conia being formed. Exposed to the air, it becomes brownish; a resin and Ammonia are formed. It boils at 370°. Its formula is $C_{16}\,H_{15}\,N$. Platna infers from his experiments that it consists of two distinct bases. Like Ammonia, it contains no Oxygen. Subjected to a strong decomposing heat, an empyreumatic oil is yielded, which is very poisonous. It is most easily obtained by cautiously distilling over a Chloride of Calcium bath a mixture of strong solution of Potash with the alcoholic extract of the unripe fruit. (*See* Dr Christison's paper, Trans. Roy. Soc. Edin. 1836.) Wertheim has found in Hemlock another alkaloid, which he names *Conydria.* Like Conia, it is volatile, and displaces Ammonia from its compounds. It differs from it in being a crystalline solid.

Tests.—Hemlock may be recognised by the characters which have been given of the plant and fruit, and the activity of the leaves, and efficiency of the officinal products may be tested by triturating them with *Liq. Potassæ,* when a strong odour of Conia should be evolved. By this it has been ascertained that some preparations contain no Conia, either from defective preparation or from subsequent change. This accounts for some of the discrepant statements respecting the efficiency of Conium as a medicine.

Action. Uses.—Narcotic Poison, having been supposed to excite convulsions and fatal coma. But from Dr Christison's experiments, it seems that it exhausts the nervous energy of the spinal cord and voluntary muscles, occasioning merely convulsive tremors and slight twitches, and eventually general paralysis of the muscles, and consequent stoppage of the breathing. Hemlock has long been employed as a Deobstruent and Alterative in glandular and visceral enlargements. Scirrhous, Cancerous, and Scrofulous diseases have been greatly relieved by it. (*See* Bayle.) Useful also as an Antispasmodic in Hooping and other Coughs. It has been tried in Tetanus. As an Anodyne and Hypnotic, it allays pain and irritation, and promotes sleep.

Dose.—Of the *Powder*, fresh and well-dried, gr. iij.–gr. v., 2 or 3 times a-day.

SUCCUS CONII, B. Juice of Hemlock.

Prep.—B. Bruise *fresh leaves of Hemlock* ℔vij. in a stone mortar, press out the juice, and to every three measures add one measure of *Rectified Spirit.* Set aside for seven days, and filter. Keep in a cool place.

Dose—ʒß–ʒj.

EXTRACTUM CONII, B. Extract of Hemlock.

Prep.—B. As Extractum Aconiti.

(Like the other green extracts of the B. P., this contains the green colouring matter of the juice, but the albumen, which causes the extract to ferment, is separated. The extract of the L. P. was simply an inspissated juice; in the formula of the D. P. both the chlorophyll and albumen were separated, and an extract obtained which was almost soluble in water.)

When the extract is triturated with *Liq. Potassæ*, a strong odour of Conia should be disengaged, as in the preparation of Vapor Coniæ.

This extract, when well prepared, is of a fine deep-green colour, and may be kept good for some time. Evaporating the Tincture also forms an excellent extract. (*c.*)

Dose.—Gr. iij. 2 or 3 times a-day, and gradually increased.

TINCTURA CONII, B. Tincture of Hemlock (Fruit).

Prep.—B. *Hemlock fruit* bruised ℥ijß, *Proof Spirit* Oj. Made by percolation as Tinct. Aconiti. (The L. Tincture was made from the dried leaves.)

Action. Uses.—Dr Christison considers the Tincture obtained by the process of percolation the best of all preparations for medical use. Mr Archer states that Rectified Spirit is the best solvent for Hemlock, as it abstracts the active principles, leaving behind the inert vegetable matters.

Dose.—♏xx.–♏xxx. Much stronger than the tincture of the L. P., which more nearly resembles the Succus Conii, B.

PILULA CONII COMPOSITA, B. Compound Hemlock Pill.

Prep.—Rub together into a mass *Extract of Hemlock* ℥ijß, powdered *Ipecacuanha* ℥ß, and *Treacle* q. s. (From L. P. restored in 1867.)

Action. Uses.—Anodyne Expectorant in Spasmodic Coughs; in doses of gr. v.

[UNGUENTUM CONII, L. Hemlock Ointment.

Prep.—Take fresh leaves of *Conium* ℔j., and boil them in *Lard* ℔j. till crisp. Express through linen.

Action. Uses.—As oil and fatty matters take up some of the active properties of Hemlock, this is an efficient application to foul or painful ulcers, &c.]

CATAPLASMA CONII, B. Hemlock Poultice.

Prep.—Mix *Hemlock Leaf* in powder ℥j. and *Linseed Meal* ℥iij., and add gradually to *Boiling water* ℥x., constantly stirring.

Action. Uses.—Soothing application to Cancerous and other sores.

VAPOR CONIÆ, B. Inhalation of Conia.

Prep.—Take of *Extract of Hemlock*, gr. lx.; *Solution of Potash*, fʒj.; *Distilled water*, fʒx. Mix. Put ♏xx. of the mixture on a sponge, in a suitable apparatus, so that the vapour of hot water passing over it may be inhaled.

Introduced in 1867. The volatile alkaloid, Conia, is set free by the Potash, and may be inhaled in painful affections of the larynx and fauces.

Tribe *Coriandreæ.* Fruit contracted from the side, didymous or globular. Ridges apterous.

CORIANDRUM, B. Coriandrum sativum, *Linn.* The ripe Fruit dried. Coriander.

CORIANDRI OLEUM, B. The Oil distilled (in England) from Coriander.

Coriander was the *gad* of the Hebrews, and was well known to the Greeks by the name *κόριον*. It has long been cultivated throughout the East, and is so now in Europe, as well as in this country.

Stems annual, from 1 to 2 feet high, round, striated, smooth. Leaves bipinnate, cut; leaflets of the lowermost wedge-shaped, of the others divided into linear segments. Calyx of 5 teeth. Petals white, often with a tinge of pink, obcordate, with an inflexed lobe, the exterior ones radiant and bifid. Fruit globose. Carpels with the primary ridges obsolete, the 4 secondary ones prominent, keeled. Interstices without vittæ. Commissure with 2 vittæ. Seed excavated in the front, covered with a loose membrane.—Occasionally found wild in this country, but must have escaped from cultivation.—St. and Ch. 94.

Coriander is much esteemed on account of its fruit (seeds, as they are commonly called) both in the East, where it is much employed as a condiment, being an ingredient, for instance, of Curry Powder, and also in Europe, where it is required by confectioners and distillers. Coriander is well known by its globular form, and by its two carpels adhering firmly together, and forming a greyish-coloured fruit about the size of white pepper. It has a peculiar odour, and a warm aromatic taste, dependent on the presence of a yellowish-coloured volatile Oil, which necessarily possesses in a high degree the qualities of Coriander. Kawalier finds it on analysis to be an Oil of the Camphene family, having the composition C_{10} H_9 O.

Action. Uses.—Stimulant Carminative in doses of gr. x.–gr. lx. Chiefly employed as an adjunct.

Off. Prep.—Confectio Sennæ. Tinctura Sennæ.

Many other plants of this order have been in use as diffusible stimulants in different parts of the world. Of these the following is more remarkable on account of the reputation which it suddenly acquired in this country a short time since, than for any notable medicinal virtues.

SUMBUL RADIX, B. Sumbul Root. Dried transverse sections of the root of an unknown plant (from Russia and India).

Sumbul (introduced into notice by Dr Granville in his pamphlet —the *Sumbul*) is the name of a drug which is probably the produce of Central Asia, and has lately been imported in some quantities, partly from Bombay and partly from Russia. It is a root,—of what plant is not known, but it is snpposed to be an Umbellifer (Reinsch and Buchner).

The word *Sumbul* or *Sunbul*, written also *Senbul*, is used as a generic term in Persian and Arabic works on Materia Medica. See *Spica*, that is, *Nardum;* in the Latin translation of Avicenna; and *Senbel*, No. 1042, 1048, and 9, in F. Gladwin's *Ulfaz Udwieh.* Dr Royle obtained in India, under the name of *Sumbul-ăl-teeb*, or fragrant Sumbul, the root-stocks of *Nardostachys Jatamansi*, the *Nardos* or Spikenard of the ancients. *Sumbul roomee* was said to be *narden uklutee;* this is thought to be *Valeriana celtica*, and *Sumbul jibullee*, or mountain nard, supposed to be *Valeriana tuberosa.* A *Sumbul-i-farsee*, or *Persian sumbul*, is supposed by some to refer to *Adiantum Capillus Veneris*, but it has the description of Hyacinthos by Dioscorides applied to it; *Polyanthes tuberosa* is substituted for it in India. A *Sunbul-i-khatai*, or Cathayan Sumbul, is also mentioned. This may be the Sumbul lately introduced into this country, and included in the B. P. of 1867.

The root is in yellowish-grey fragments, 3–4 inches across, $\frac{1}{2}$–$1\frac{1}{2}$ inch thick, with a brown bark, often hairy and the interior fibrous, having very much the appearance of pieces of inferior Rhubarb. All specimens have a strong musky smell, apparently owing to a peculiar volatile oil. The taste is at first sweet, afterwards bitter and balsamic. It is said to be employed in Persia as a protection against mephitic vapours. In England it has been recommended as a remedy in Asthma, Hysteria, and Epilepsy. The tincture is the form in which it has generally been given. It is possessed of antispasmodic and stimulant powers.

TINCTURA SUMBUL, B. Tincture of Sumbul.

Prep.—Take of *Sumbul Root*, in coarse powder, ℥ijſs; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Dose.—♏x.–♏xxx., as an Antispasmodic.

Several plants of the Umbelliferous order possess febrifuge and tonic properties. Among them may be distinguished common Parsley and Celery. From the seeds of Parsley (*Apium Petroselinum*) Drs Joret and Homolle obtained a product which they proposed to the French Academy as a substitute for Quinia.

Apiol is obtained by exhausting parsley seeds with alcohol, evaporating off most of the spirit, and acting on the residue with ether or chloroform. It is a heavy oily liquid, of a pungent taste and odour, insoluble in water and not volatile. It has been given in intermittents in doses of 5–15 drops, in capsules or suspended in mucilage. (*Mémoire sur l'Apiol*, Paris, 1855.)

The *Hydrocotyle Asiatica*, a small umbelliferous plant of India, is employed by the natives as diuretic and diaphoretic, and has been lately recommended by M. Lépine as a remedy in skin diseases of a chronic kind. 5–10 gr. of the powdered herb may be given at a dose, or ½–1 gr. of the alcoholic extract.

The ARALIACEÆ are closely allied to *Umbelliferæ;* but as they do not contain any officinal plants, a detailed notice of them here is not necessary. *Panax quinquefolium*, of which the root, called *Ginseng*, is so highly esteemed by the Chinese as to be considered a *panacea*, used to be sold for its weight in gold. It has a feeble odour, and a sweet, slightly aromatic taste, abounds in fecula, and can only be useful as a Nutrient and Demulcent. It is found in the northern parts of China, in Tauria, and in North America. A nearly allied species, *Panax Pseudo-Ginseng*, was found in the Himalayas by Dr Wallich. *Aralia nudicaulis*, a native of North America, having roots which are slightly fragrant, and of a sweetish aromatic taste, is sometimes called *False*, and used as a substitute for true *Sarsaparilla*. *A. spinosa*, called *Angelica* or *Toothache-tree* in North America, is a stimulant Diaphoretic.

The CORNACEÆ include plants that abound in bitter and astringent principles, but none are officinal in the British Pharmacopœias. According to Landerer, the fruit of *Cornus mascula* is in frequent use as a styptic among the Turks, being also employed by them in diarrhœa and cholera, and used in the manufacture of sherbet. The fruits of *C. officinalis* enter into the composition of popular fever-drinks in Japan. And the inspissated juice of the green bark of *C. circinata*, or the round-leaved Cornel, has enjoyed a high reputation as an astringent tonic in the United States of America, having even been substituted for Cinchona in the treatment of intermittents.

The CRASSULACEÆ are generally distinguished by the acrid nature of their juices, some of the order being also astringent. The *Cotyledon umbilicus*, Linn., grows abundantly on rocks and old walls in the west of England. It has some diuretic action. It has long been in use as a popular remedy for hysteria, as well as for the purpose of destroying corns and warts. Of late years its use has been revived by Mr Salter of Poole, and it has been highly spoken of by him and by other practitioners as a remedy for Epilepsy. The expressed and inspissated juice of the whole plant, but particularly of the succulent leaves, is given for some time in doses of ʒß or more. Dr Pappe (*Flor. Cap. Med. Prod.*) makes mention of the *C. orbiculata*, of Cape Town, as a known and tried remedy for the same disorder. It is also used by the Boers and settlers as an external application for the same purposes as the other in England.

Sub-class III. Corollifloræ.

Caprifoliaceæ, *Juss.*

The Caprifoliaceæ are found in temperate and cold parts of the world, and are not possessed of very active properties.

Sambuci Flores, B. Sambucus nigra, *Linn.* The fresh Flowers. *Pentand. Trigyn.* Linn. Common Elder.

The Elder, indigenous in Europe, was known to the Greeks, and called ἀκτή by Dioscorides.

Arborescent; much, but always oppositely branched; young branches filled with spongy pith. Leaves pinnate; leaflets usually 2 pairs with an odd one, ovate, serrate, cuspidate. Cymes large, terminal, with 5 principal branches. Calyx limb 5-cleft. Corolla cream-coloured, rotate, 5-lobed, finally reflexed, with a faint smell. Stamens 5. Stigmas 3, sessile. Berry globular, black, 3–4 seeded.—St. and Chi. ii. 79.

Though many parts of the Elder have been officinal at different times, few are possessed of any active properties. A little of the Volatile Oil, upon which the odour of the flowers depends, may be separated by distillation; but Dr Pereira has shown that the once officinal Oil of Elder is a spurious preparation made by boiling Elder leaves in Rape Oil. But the flowers are sweet-scented, and contain a volatile oil. The inner bark of the Elder-tree has been used as a Cathartic.

Aqua Sambucci B. Elder Flower Water.

Prep.—Mix *Elder Flowers* (separated from the stalks) ℔x., or an equivalent quantity of the flowers preserved while fresh with common salt, with *Aq.* Cij. and distil Cj.

Action. Uses.—Used as a vehicle, and for flavouring medicines.

Cinchonaceæ, *Lindley.*

This order formed part of the Rubiaceæ of Jussieu, which has been separated into Galiaceæ (or Stellatæ) and Cinchonaceæ.

Galiaceæ have whorled leaves; Cinchonaceæ have opposite leaves with interpetiolar stipules. They are found in the tropical parts of the world. Some secrete bitter and astringent principles, as Quinia, Cinchonia, Tannin, and are used as febrifuges; others again form Emetina, and are used as Emetics. They occur in tropical parts of the world, and on the Andes of Peru, and mountains of India, as high as the belt of tropical vegetation.

Ipecacuanha, B. Cephaëlis Ipecacuanha, *Dec.* The dried Root. (From Brazil.) Ipecacuan. Ipecacuanha.

Ipecacuanha, a name adopted from the language of the South Americans (by whom it is also called *Praya de Mato*), has been applied to a variety of Emetic roots, but is restricted in the Pharmacopœias to the roots of the above Cephaëlis. This was first distinctly noticed in the Nat. History of Brazil of Piso, and Marcgraaf, p. 101, and p. 17 (1648), as a *brown*-coloured Ipecacuan, and distinguished from another of a *white* colour, with the plant something like Pulegium. It was first brought into notice in Europe by Helvetius, about 1686. The plant yielding it was long unknown. Dr Gomez was the first (Memoria sobre ipecacuanha fusca du Bresil, 1801) to describe and figure the genuine plant; but having left specimens with Brotero of Coimbra, and he with Tussac of Nantes, the former, without the permission of or acknowledgment to Gomez, described it in the Linnean Trans. vi. p. 137, t. 11, 1802, as a species of Callicocca. But this genus is identical with the CEPHAËLIS of Swartz, to which it was referred by Tussac and published in the Journ. de Bot. of M. Desvaux, iv. p. 204 (1813). The subject has since been investigated by Merat, Richards, Martius, and A. St Hilaire. Merat, Guibourt, and others distinguish it into three varieties, *Brown*, *Red*, and *Grey Ipecacuan*, depending on the colour of the epidermis.

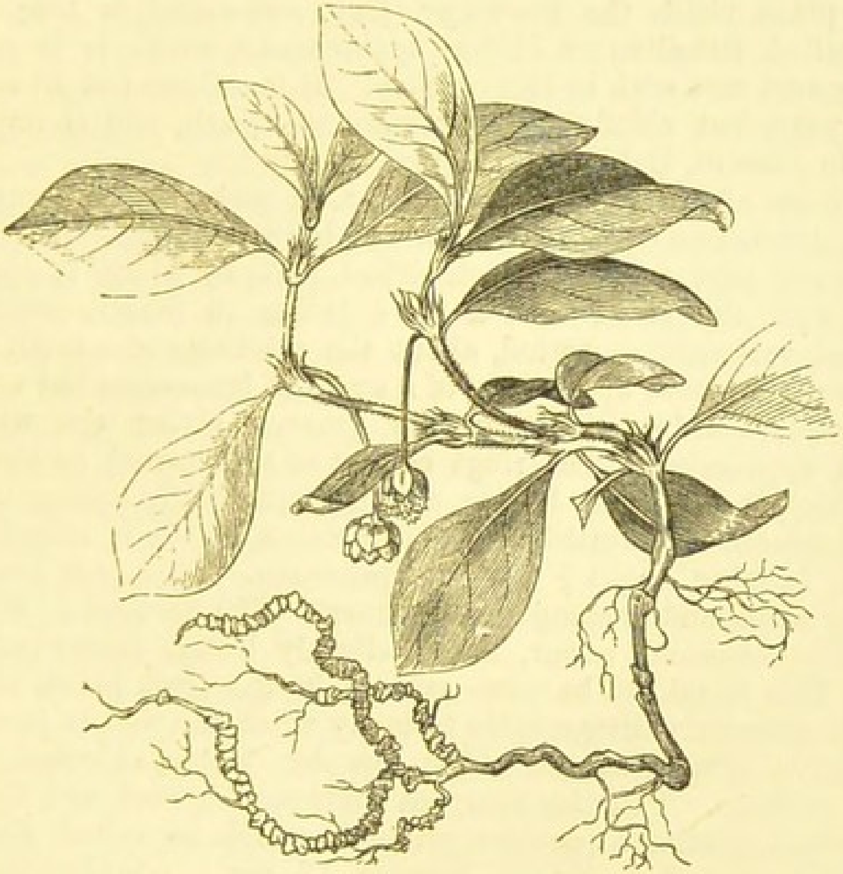

Fig. 75.

Cephaëlis Ipecacuanha (fig. 75) has a perennial root, simple, flexuose, or with a few diverging branches, a few inches in length, about the thickness of a quill, knotty, with transverse rings; when fresh, of a pale-brown colour externally. Stem suffruticose, ascending, often rooting near the ground, at length erect, somewhat pubescent towards the apex. Leaves from 4 to 6 or 8 on a stem, opposite, oblong, obovate, acute, roughish above, finely pubescent beneath. Stipules erect, 4-6 cleft. Peduncles solitary, axillary, downy, erect when in flower, drooping when in fruit. Flowers collected into heads, and enclosed by a large 1-leafed involucre, which is deeply 4 to 6 cleft. Segments obovate. Bracts one to each flower, obovate, oblong. Calyx minute, with 5 blunt short teeth. Corolla white, funnel-shaped; tube downy on the outside and at the orifice; limb with 5 ovate reflexed segments. Stamens 5, with filiform filaments and linear anthers, which project a little beyond the corolla. Ovary surmounted by a fleshy disk. Stigma bifid. Berry about the size of a coffee-bean, of a dark violet-colour, crowned by the remains of the calyx, 2-celled, 2-seeded, with a longitudinal fleshy dissepiment. Nucleus plano-convex, furrowed on the flat side. Flowers from November to March, and ripens fruit in May.—A native of shady places in the forests of Brazil from the province of Rio Janeiro to that of Pernambuco. Found also in forests near Villa Mena by Weddell. Fig. *v.* Gomes 1, c. 1, 2. Linn. Trans. vi. t. 11. Martius Spec. Mat. Med. Bras. 4. t. 1. St Hilaire. Pl. Us. de Brazil. pl. 6. Nees and Eberm. 258. St. and Ch. 62.

This plant yields the Brown or Grey, *annulated*, or true, sometimes called Brazilian or Lisbon Ipecacuanha, which is in general the only sort met with in this country. It is collected at all seasons of the year, but chiefly from January to March, and is imported from Rio Janeiro, Bahia, and Pernambuco.*

The roots of *annulated* Ipecacuanha, as met with in commerce, are of a greyish or light-brown colour,—have sometimes attached to their upper part a straight cylindrical part, by which it was connected with the stem,—are 2 or 4 inches in length, simple or branched, variously contorted, about the thickness of a small quill, —and are composed apparently of a series of transverse but unequal rings, separated by nearly parallel grooves, giving the whole a knotted appearance. The rings consist of an external *cortical* portion, which is horny but brittle, and are apparently strung upon a slender, tough, and whitish ligneous portion, which is called *meditullium*, forming about $\frac{1}{5}$ of good Ipecacuan. This part has little odour or taste, and is comparatively inert. The cortical portion has a peculiar nauseous odour, and a slightly bitter, somewhat acrid taste. This is said to be more evident in the fresh plant, and the odour is extremely disagreeable to many when the root is powdered. The active properties are taken up by Water, Alcohol, Proof Spirit, or Wine. Pelletier analysed Ipecacuanha root, and found in the cortical portion a peculiar principle which he called *Emetina*, but which is rather *Emetic Extract*, 16 parts, odoriferous Fatty matter 2 (this consists of an odorous volatile oil, and of a scentless fixed fatty matter), Wax 6, Gum 10, Starch 42, Lignine 20 parts, loss 4 parts = 100. The Red variety contained only 14 per cent. of *Emetic Extract.* The Meditullium contains only about 1 per cent. of Emetic Extract, and about 67 per cent. of Ligneous fibre.

The Emetic Extract, or *Matière Vomitive* as it was first called, was afterwards shown to be impure, and good Ipecacuanha found to contain only about 1 per cent. of pure *Emetina.* This is colourless, uncrystallisable, alkaline in its properties, without odour, and nearly

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* Dr Weddell states that the plant is usually called *Poaya* in Brazil. It grows extensively in that country, but the present exportation takes place chiefly from the province of Motto-Grosso. The shrubs are found growing under the shade of large trees in the tropical forests siutated in the basin of the Rio Paraguay and its tributaries, not in localities subject to the inundation of rivers, but on elevated spots, rooting in a moist sand impregnated with vegetable remains. In such places the *Cephaëlis* is found in clumps, called *Redoleros* by the gatherers.

without taste; fusible at about 120°, sparingly soluble in water, but very much so in Alcohol or Proof Spirit. It forms bitter salts with acids, and is precipitated when in solution by Tincture of Galls. Sesquichloride of Iron imparts a greenish colour to the decoction of Ipecacuanha. Emetina is composed of $C_{35} H_{25} O_9 N$. Impure Emetina, which is that most frequently met with, is of a yellowish-white colour.

Besides this important constituent, Willick has found in Ipecacuanha root a new acid, which may be called *Cephaëlic acid*, and bears some analogy to Gallic′. The formula calculated for it is $C_{14} H_8 O_6 + H O$. It is soluble in Alcohol and in Water, less so in Ether. It produces the above-mentioned green colour with a solution of Sesquichlor. Iron. With Ammonia it strikes a violet, and with excess of the same alkali a deep black.

A kind of *Ipecacuanha*, known as *striated* and also as *Black* or *Peruvian Ipecacuan*, is yielded by a different plant of this family, with much larger joints, the *Psychotria emetica*, of the tribe Coffeæ, a native of New Granada, which indeed was at one time supposed to yield the true kind. Pelletier found that it contained about 9 per cent. of his impure Emetina.

A third kind of Ipecacuanha, and that referred to by Piso, is the white kind, distinguished by its *white* colour, *amylaceous* nature, and *undulated* appearance. This is yielded by *Richardsonia scabra* (*R. braziliensis* of other authors), a plant of the tribe *Spermacoceæ* of this family, a native of Brazil, New Granada, Vera Cruz, &c. *R. rosea* yields a similar product. This kind contains only about 6 per cent. of impure Emetina.

Several other Rubiaceous plants are emetic in nature, and some of other families, as some species of *Polygaleæ*, of *Asclepiadeæ*, and of *Euphorbiaceæ;* and of *Violaceæ*, *Ionidium Ipecacuanha*. *I. parviflorum* yields the Cuichuncully de Cuença.

Action. Uses.—Irritant, Nauseant Emetic, Expectorant, Diaphoretic, Sedative. Useful as an Expectorant and Diaphoretic in Catarrh, as a Diaphoretic in febrile affections of various kinds, or to cause a determination to the skin in Diarrhœa and Dysentery. Emetic to cut short the accession of an ague, &c., evacuate the stomach, or give a shock to the system. Nauseant Sedative in Hæmorrhage, &c.

Dose.—Gr. xv.–gr. xx. or even xxx. of the powder as an Emetic; often conjoined with Tartar Emetic gr. j., assisting its action with warm water or Chamomile Tea. Gr. ij. as a Nauseant. Gr. j.–gr. ij. as an Expectorant and Diaphoretic. Gr. $\frac{1}{2}$ as an Alterative in Dyspepsia, or of Emetina gr. $\frac{1}{16}$.

VINUM IPECACUANHÆ, B. Ipecacuanha Wine.

Prep.—B. Macerate *Ipecacuhan bruised* ℥j. in *Sherry Wine* Oj. for 7 days, with occasional agitation; strain, express, and filter. Make up to Oj.

Action. Uses.—Expectorant and Diaphoretic in doses of ♏x. to

♏xxx. Emetic in doses of fʒij. to fʒiv. Often given to children in doses of ♏xx. to fʒj. (It is one-fourth weaker than the L. Prep.)

Pulvis Ipecacuanhæ compositus, B. Pulvis Ipecacuanhæ cum Opio (B. 1864). Compound Ipecacuan, or Dover's Powder.

Prep.—B. Mix thoroughly *Ipecacuan* in powder and *Opium* āā ℥ß; *Sulphate of Potash*, ℥iv.; pass the powder through a fine sieve, rub it lightly in a mortar, and keep in a stoppered bottle.

Action. Uses.—1 gr. in 10 of Opium. Diaphoretic in doses of gr. v.–gr. x., sometimes repeated at short intervals. One of the most valuble Sudorifics; the Opium apparently causing a determination to the skin, and the Ipecacuan its relaxation. Dr Dover directed his powder to be given in a glass of white wine posset, covering up warm, and drinking about a quart of the posset while sweating. It is often necessary to avoid drinking too soon, to prevent vomiting.

Pilula Ipecacuanhæ cum Scilla, B. Pill of Ipecauanha and Squill.

Prep.—Take of *Pulv. Ipecac. Co.* ℥iij., *Squill freshly powdered* and *Ammoniacum powdered* āā ℥j., *Treacle* q. s. Beat all together that a mass may be formed. (From L. P., restored in B. 1867.)

Action. Uses.—Diaphoretic and Expectorant.

Dose.—Gr. v.–gr. x.

Ipecacuanha and Emetine are both sometimes introduced into the system by friction, in the form of liniment or ointment.

Trochisci Ipecacuanhæ, B. Ipecacuanha Lozenges.

Prep.—Take of *Ipecacuanha*, in powder, clxxx. gr.; *Refined Sugar*, in powder, ℥xxv.; *Gum Acacia*, in powder, ℥j.; *Mucilage of Gum Acacia*, f℥ij.; *Distilled water*, f℥j. or a sufficiency. Mix the powders and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains a quarter of a grain of Ipecacuanha.

Dose.—1 to 3 lozenges. (Introduced in 1867.)

Pharm. Prep.—Trochisci Morphiæ et Ipecacuanhæ; Pilula Conii Co.

Coffea arabica, *quhwa* of the Arabs (of the tribe and sub-tribe *Coffeæ*), is a native of Arabia Felix and of the borders of Abyssinia. From the former it has been introduced into, and is cultivated in, various countries. It is too well known as an article of diet to require detailed notice here, and is remarkable for *Caffeine* having been found to be identical with *Theine* (*see* p. 341), and for its stimulant or rousing influence on the brain, especially in those unaccustomed to it use. Hence it is employed as a Cerebral Stimulant and Anti-soporific, and to counteract the effects of Opium and other Narcotic poisons. An infusion of the roasted leaves is drunk in Sumatra.

CINCHONA, B. Pale, Yellow, and Red Barks, produced by different species of CINCHONA.

Cinchona was named by Linnæus in compliment to the Countess of Chincon, lady of the then Viceroy of Peru, who was cured by, and who brought from thence to Europe in 1639 some of this celebrated and invaluable bark. The native names *quinquino* and *quina-quina* are, however, very similar to the scientific one. It is also called *cascarilla* in South America. The history of the discovery of Peruvian bark is obscure. The natives are supposed to have been unacquainted with its virtues, but the Indians of Malacatos knew them in 1739, and others before 1696. Its medicinal use was thought to have been discovered by the Jesuits, who chiefly made the bark known at an early period in Europe. The plant or plants yielding the bark were long entirely and are still in some measure unknown. The first published notice seems to be that of Dr Arrot in the Philosophical Transactions for 1737. In that year also La Condamine visited Loxa, and sent a memoir, Sur le Quinquina, in the following year to the *Acad. Royale des Sciences.* He obtained specimens of the best kind of bark, the *Cascarilla fina de Loxa*, and the species which he figured has been since named *Cinchona Condaminea.* Joseph de Jussieu visited the province of Loxa in 1739, also Upper Peru, and penetrated almost to the frontiers of Brazil. His many descriptions have remained unnoticed until very recently. About the year 1772 Mutis sent a few specimens to Linnæus from the mountains of New Granada, and with his pupil, Zea, promulgated some inaccurate information about what they conceived to be officinal barks of Peru. As at first only a single kind of bark (that of Loxa) was known, but followed in 1775 by some sent by Mutis, and then by a great variety distinguished by various commercial names, so one species of Cinchona, named *C. officinalis,* was supposed to yield the officinal bark. The specimens, however, from which the species was named having been discovered to belong to different plants, the name is not now recognised ; but in its place we have several well-known and excellently figured species of Cinchona, which are carefully distinguished from those which belong to allied genera. The Spanish Government, in addition to the employment of Mutis, instituted another expedition for the investigation of the Cinchona forests and vegetation of Peru. This Ruiz and Pavon commenced in the year 1777, and at their departure they were assisted by Taffala and Manzanilla. From 1798 to 1802 they published much valuable information respecting, and gave accurate figures of, several species of Cinchona in their *Flora Peruviana*, and *Quinologia* with its *Supplemento.*

The celebrated Humboldt with Bonpland visited the same regions, and in the *Plantæ Æquinoctiales* figured and described some of the species. Pöppig investigated, and has given valuable information respecting, the species and barks of the districts of Huanuco and Cuchero in his *Reise in Chili, Peru, &c.* Dr Weddell, during the years 1846 and 1847, carefully investigated the Cinchona regions of Bolivia and of a part of Peru, between 19° and 13° of south latitude, where he discovered the species (*C. Calisaya*) yielding the *yellow* bark of English commerce. He has published the results of his investigations in a magnificent folio entitled *Histoire Naturelle des Quinquinas*, Paris, 1849, which may serve as a model for such monographs.

The species of Cinchona made known by the travellers and botanists previous to Weddell were elucidated by Mr Lambert, in his works on the genus Cinchona, and by De Candolle in his Prodromus; but most fully by Dr Lindley in his *Flora Medica*, he having, as materials to work upon, the above-mentioned publications —a very extensive series of dried specimens belonging to the late Dr A. T. Thomson, which had been taken out of a Spanish prize, having been collected by Mutis in 1805, near Loxa and Santa Fé de Bogota—also the valuable collection of Lambert (now in the British Museum), which contained a nearly complete set of the species which had been described in the *Flora Peruviana.* From these various sources, 24 species of Cinchona were described in botanical works. These, Dr Weddell, having seen many of them growing in different situations, has reduced to 11, but has been able to add 8 new ones. The whole number of species of Cinchona, according to Weddell, is 19. His distribution "appears entirely conformable to nature, since the chemical composition supports the botanical characters; for the true species of Cinchona alone afford Quinine and Cinchonine, while astringent principles alone are found in the genus Cascarilla." *Rapport à l'Acad.*

Many species formerly described as true species of Cinchona, have now been referred to the genus Cascarilla, which is an unfortunate name, as it leads to ambiguity; other species have been referred by other botanists as well as by Weddell to other allied genera; as Exostemma, Remijia, Buena, Pincneya, Danais, Lasionema, Ladenbergia, Cosmibuena, Luculia, Hymenodictyon, Gomphosia.

The genus Cinchona (fig. 76 and 77) is distinguished by having the calyx turbinate, united with the ovary, 5-toothed. Corolla hypocrateriform, with a roundish tube, limb 5-fid, laciniæ lanceolate, hairy at the margin, and, like the tube, pubescent on the outside, valvate in æstivation. Stamens 5 alternate, filaments inserted into the lower part of the tube of the corol; anthers included or protruding beyond the tube of the corol. Ovary, with a fleshy, cushion-like disk. Ovules numerous, imbricated, anatropous. Style simple. Stigma, either concealed within or protruding beyond the corol. Capsule ovate, oblong, or linear lanceolate, furrowed on two sides, crowned with the limb of the calyx, smooth or pubescent, 2-celled, many-seeded, valves separating from the base to the apex. Seeds numerous, peltately affixed to the placentæ, imbricated, compressed, with an oblong nucleus, surrounded by a membranous denticulate wing. Embryo straight in the margin of a fleshy albumen, cotyledons ovate entire, radicle round inferior. The species form evergreen trees or shrubs. Stems and branches round. The cellular parts contain most Cinchonine and the fibrous Quinine. Periderm various, sometimes thin, at other times thick. Wood whitish, becoming at length yellowish, with false medullary rays.—Weddell. Leaves opposite, petiolate, smooth, pubescent or tomentose, with peculiar reflection from the surface in consequence of the structure of the cellular tissue. Stipules interpetiolar, often free and deciduous, or slightly connate at the base, with numerous minute glands on the inside, which secrete gum-resinous matter at the base. Flowers cymoso-paniculate, white, oftener flesh-coloured or purple, very fragrant, panicles terminal, branchlets and pedicels bracteate at the base.

The true Cinchonas are confined exclusively to the Andes, and grow chiefly on the eastern face of the Cordilleras, where occurs the zone of forests, from about 4000 to near 12,000 feet of elevation above the sea. In some places they occur on the western face, where this is covered by forests. The Cinchonas themselves seldom form an entire forest, but rather groups (called *manchas*). Frequently they grow separately, sometimes in exposed situations, where even the arborescent species do not grow beyond the size of shrubs. The characteristics of this forest are of a tropical nature. Palms seem to be found throughout, and in many parts form the principal feature. Along with these there are Tree Ferns, gigantic Climbers, Bamboos, Plantains, Aroideæ, Cecropias, Melastomaceæ, an Oak, a Myrica, and other genera, as in the lower and southern Himalayas, as well as on the Neilgherries. There would appear to be always great moisture, with probably a mean temperature of about 62°.

The Cinchona region forms a great but comparatively narrow arc of a circle which has its convexity towards the west, and of which the most western part is near its middle or about Loxa, where it approaches the sea. The northern extremity of the arc reaches nearly to Caraccas, about 10° of N. lat., while the southern extremity reaches to near Santa Cruz de la Sierra in Bolivia, about 19° S. lat., near where Dr Weddell discovered the species called *Cinchona australis*. *C. Ronaima* of Guiana has been removed to the genus Cascarilla, as also *C. magnifolia*, supposed at one time to be the species which yielded Red Bark. It is found generally at the bottom of valleys, whilst the true Cinchonas are found in more elevated parts.

A region of forests previously unexplored is first examined by *practicos* or experienced *cascarilleros*—that is, Indian bark collectors. A *major domo* is then sent into the forest, who receives and examines the bark as it is brought in by the cascarilleros, having previously distributed provisions to them. The bark is peeled about the month of May, or at any time excepting during the rainy season. It is either cut from the trees as they stand, or the trees are felled a little above their roots. This is the preferable method, as suckers shoot up from their roots, and soon yield profitable bark. The periderm is removed by striking the trunk with a mallet. The bark is sometimes cleaned with a brush, and then taken off by uniform incisions in pieces about 15 to 18 inches long and 4 or 5 inches wide. The thinnest pieces of bark from the branches or small trunks are simply exposed to the sun's rays, and soon assume the form of hollow cylinders, or that of the quilled cinchona. The bark from the large trunk, which is to constitute the flat (*tabla* or *plancha*) Cinchona, undergoes a certain degree of pressure during the process of drying. The major domo rejects the bad specimens of bark and sews the remainder up in coarse canvas. When it reaches the depots in towns an outer envelope of a fresh hide forms the packages, known by the name of *serons*, which usually contain only one kind of bark. The mode of cutting down the trees or stripping them of their bark is most wasteful; and as no means are adopted of repairing this continued destruction,* the probable result will be with the more distant as has already occurred with the nearer forests, that a partial or entire disappearance may take place of the more valuable kinds of Cinchona.

The genus Cinchona, as at present constituted, includes all the species which yield barks suitable for medicinal use. The genus Cascarilla and others yield spurious barks, which are sometimes introduced into commerce mixed with the genuine barks. The characters of all, therefore, require to be studied. Though many species of Cinchona are known, and likewise a great variety of barks, there has always been considerable difficulty in determining which of the latter are produced by the known species of the former. M. Pavon sent Mr Lambert forty-four sorts of Peruvian barks with their names; but these were made little use of until recently. Pöppig collected specimens of the bark at the same time with specimens of the plant, and had the former examined by Reichel. This plan has been fully carried out by Dr Weddell with a still greater number of species. The greatest mistakes have occurred in consequence of Mutis and Zea having taken for granted that the barks of the north were identical with those of the south, and consequently that the trees which yielded the yellow and red barks of Carthagena must be the same as those which produced the yellow and red barks of Lima; a mistake by which they led not only Humboldt into error, but also Mr Lambert and the authors of the London Pharmacopœia of 1836.

The commercial names of the different Cinchona barks lead to considerable confusion and ambiguity. Thus one or two are named from the place of export, as Carthagena, though they are produced near Santa Fé; others from Lima, the produce of the forests of Huanuco and of Upper Peru; one from Arica, though brought from the interior; while the others are named from the places near to which they are produced, as Loxa, Huanuco, Huamalies, Jaen, Carabaya, and Cuzco. These generally indicate the best kinds of their respective districts. But the names are far from distinctive, for other barks are also exported from the same places. They are also named from their physical appearances, chiefly, however, from colour. This is the method adopted in the British Pharmacopœia, which mentions *Pale*, *Yellow*, and *Red* Barks; the Edinburgh College substituted *Crown* and *Silver* Barks for the first. This

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* The government of Bolivia has several times attempted, by special decrees, to check the rapid and wholesale destruction of the Calisaya forests; but so great an opposition was offered to these measures, that it was at length compelled to remove all restriction on the collection of bark.

method was adopted by Bergen in his monograph, pronounced by Dr Duncan to be "the most perfect specimen of Pharmacography," then by Guibourt in his "Histoire des Drogues," and lastly by Dr Pereira, and no doubt affords considerable convenience for practical purposes. It is, however, liable to the objection that the names of the same colours are applied to totally different barks in the different Cinchona provinces. Mutis and Zea, moreover, named the barks of Santa Fé from the colour of the powdered bark; while in Peru the barks are named from the external appearance of the bark; or from the white or black lichens which adhere to its surface, the growth of which necessarily depends on local influences of climate and exposure. Mr Howard has observed that the method of the botanists of Santa Fé, though open to objection, is capable of being generally appreciated; that the second method is certainly not thus obvious, though he believes very correct; the third method, or that from the lichens, he considers to be altogether deceptive.

Dr Weddell has proved what had before been inferred from chemical composition, that the barks of the young branches of several species constitute the *pale* barks of commerce, which become *yellow* or *red* in older plants, or in the older parts of the same plants. The barks may, moreover, be arranged according to their chemical constituents, as has been done by Göbel and Geiger. Eventually they must be arranged according to the plants which yield the different kinds of bark—that is, as soon as our information is a little more complete. But at present it is preferable to adhere to the arrangement of the Pharmacopœia combined with that of commerce, as this affords certain advantages for practical purposes.

Before proceeding to the different kinds of bark, we may make a few observations on their structure. The bark of trees, as already stated, is composed of two cellular layers below the epidermis, the inner, or liber, being composed of cortical fibres with the proper laticiferous vessels. The outer part of the bark, as it is pushed outwards, dies, and it is by Mohl called *periderm*, and the inner living part the *derm*. In the Cinchonas it is the derm which is employed, because it contains the alkali quinine. It is composed either of the *fibrous* layer alone, or united with more or less of the cellular tissue. It is not, however, in the fibres themselves that the quinine is found, nor in the laticiferous vessels, but it is rather within cells, in the midst of which the fibres are spread. In Cinchonas, where the cellular part is considerable, as in *C. pubescens*,—or in the pale barks, which are from the young parts of plants, and where the fibrous part is not fully developed, or found only in the interior half of the bark, and where several fibres are united in bundles,—cinchonine is chiefly found.

The proportion between the fibres and the surrounding cellular tissue most favourable for the secretion of quinine, seems to be where the fibres are short, of nearly equal length, and uniformly dispersed throughout cellular tissue filled with resinous matter, which is interposed in thin layers between the fibres, as is seen in the transverse fracture of *C. Calisaya.* Other barks, equally fibrous, present a different arrangement, inasmuch as the fibres, which are much longer and unequal, their ends being attached one to the other, are often collected together in bundles, especially towards the inner surface, and are thus increased in thickness, with proportional diminution of the interposed cellular tissue. This structure is well seen in the bark of *C. scrobiculata.*

From these facts it would follow, that the fracture of a Cinchona bark ought, to a certain extent, to show its medicinal powers; that is, the quantity of quinine in a fibrous, or of cinchonine in a corky bark. The larger quills may be expected to contain more alkaloid than those which consist almost entirely of outer layers. The tannin, Dr W. observes, is found chiefly in the cellular part of the bark. He has named these three modifications of structure,—the first corky, the second fibrous, and the third (filandreuse) filamentous; and he observes that the structure of all the Cinchona barks more or less resembles one or other of these three types. Winckler does not admit all this.

The different barks of the Cinchonas were described by Bergen in his monograph, under nine different heads, derived from the physical properties of these barks. M. Guibourt then arranged them under the divisions of Grey, Yellow, Red, White, and False Cinchonas, and described a great number of varieties. Dr Pereira adopted these general heads, incorporated much of the descriptions of Bergen (*see* Elements of Materia Medica), and added greatly to the value of his synonyms in consequence of having exchanged specimens both with Bergen and with Guibourt, and thus identified the German, French, and English names by a comparison of the several kinds of barks. Dr Christison has been able to confirm many of these results, from having also received many of the same barks. It has been already mentioned that Pöppig having brought home barks of some of the Cinchonas which he had seen growing in their native sites, these were compared with the commercial barks by Reichel; and that the same course has been followed to a still greater extent by Dr Weddell, in his most admirable work, where he has given representations which rival those of Göbel and Kunze, of several of these barks. Lastly, Mr J. E. Howard, assisted by Dr Pereira, has compared the barks of commerce with the collection of Peruvian barks, woods, and plants, which is now in the British Museum, as well as with other collections, and, having identified many, has given much valuable information respecting most of them. (*See* Pharmaceutical Journal, vols. xi., xii., *et seq.;* Howard's Illustrations of the Nueva Quinologia, &c.)

The following table is slightly altered from that of Weddell, and will be of use in showing the species that produce the various barks. But in afterwards describing the latter, it will be necessary to adopt the simpler arrangement of the Pharmacopœia.

TABLE OF COMMERCIAL CINCHONA BARKS.

WITH THE BOTANICAL SPECIES FROM WHICH THEY ARE BELIEVED TO BE OBTAINED.

I.—GREY CINCHONA BARKS.

§ I.—Loxa Cinchona Barks. (Pale Bark.—Crown Bark, *Angl.*—China-Loxa, Kron China, *Germ.*)

Loxa Cinchona bark, grey compact	*Cinchona Condaminea*, H. et B.
Loxa Cinchona bark, brown compact (*Dunkele Ten China*, Germ.—*China Pseudo-Loxa*, Bergen)	*C. scrobiculata*, H. et B.
Loxa Cinchona bark, red chestnut.—Light Calisaya	
Loxa Cinchona bark, red fibrous of the King of Spain (*Quina estoposa*, Pavon).	
Loxa Cinchona bark, yellow fibrous	*C. macrocalyx*, Pav.

§ II.—Lima or Huanuco Cinchona Barks. (Silver Bark, Grey Bark, *Angl.*—China-Huanuco, Graue China, *Germ.*)

Lima Cinchona bark, grey brown (*Cascarilla provinciana*, Peruv.)	*C. micrantha*, Ruiz et Pav. or *C. lanceolata*, Ruiz et Pav.
Lima Cinchona bark, grey ordinary	
Grey bark. Fine Grey bark	*C. nitida*, Ruiz et Pav.
Lima Cinchona bark, white	? *C. purpurea*, Ruiz et Pav.
Lima Cinchona bark, very rugous, resembling the Calisaya bark.—*Cascarilla negrilla*, Peruv. (? *Cascarilla lagartijada*, Laubert.)	*C. glandulifera*, Ruiz et Pav.
Cinchona bark, red of Jaen or of Loxa	?

II.—WHITE CINCHONA BARKS.

Ash-coloured Loxa Cinchona bark (*Ash bark*, Angl. — *Blasse Ten-China*, Germ. — *China Jaen*, Bergen)	*C. ovata*, Ruiz et Pav.
Grey Cinchona bark, pale ditto	
White Loxa Cinchona bark	
White fibrous Jaen Cinchona bark	
Cuzco Cinchona bark	*C. pubescens*, Vahl., or *C. cordifolia*, Mutis.
Arica Cinchona bark	
Pale Yellow Carthagena Cinchona bark—(*Hard Carthagena bark*, Angl. — *Quina amarilla* Mutis.—*China flava dura*, Bergen)	*Ibid.*
Orange-yellow Carthagena Cinchona bark (*Quinquina de Maracaibo.—China flava fibrosa*, Bergen)	
Pitayon Cinchona bark, or false Pitaya Cinchona bark	? *Stenostomum acutatum*, DC.

III.—YELLOW CINCHONA BARKS.

Yellow Cinchona bark of the King of Spain (*Cascarilla amarilla del rey.*, Laubert)	*C. Calisaya*, Wedd.
Calisaya Cinchona bark, or Royal Yellow bark (*Konigs China*, Germ.—*Yellow bark*, Angl.—*China regia*, Bergen)	
Orange-yellow Cinchona bark—Cinnamon Cinchona bark (*Quinquina—cannelle*), light Calisaya (*Cascarilla claro amarilla*, Laub.)	*C. micrantha*, Ruiz et Pav.

Pitaya Cinchona bark (*Quinquina de la Colombie ou d'Antioquia*, Guib. Hist. Nat. des. Drog.—*Cascarilla parecida a la Calisaya*, Laub.) Woody Carthagena bark (*Quinquina de Colombie ligneux*)	*C. academica?* *C. Condaminea*, Humb. et Bonp.
Orange Cinchona bark of Mutis (*Spongy Carthagena bark; New Spurious Yellow Bark*, Pereira)	*C. lancifolia*, Mutis.

HUAMALIES CINCHONA BARK. (Rusty Bark, *Angl.*—China Huamalies, Braune China, *Germ.*)

Huamalies Cinchona bark, dull grey	*C. hirsuta*, Ruiz et Pav.
Huamalies Cinchona bark, thin reddish	? *C. purpurea*, Ruiz et Pav.
Huamalies Cinchona bark, white	?
Huamalies Cinchona bark, ferruginous	*C. micrantha*, Ruiz et Pav.
Yellow Cinchona bark of Cuenca	*C. ovalifolia*, H. et B.

IV.—RED CINCHONA BARKS.

(Red Bark, *Angl.* Rothe China, *Germ.*)

Red Cinchona bark, officinal	*C. Succirubra*, Pav., or *C. ovata*, var. *erythroderma*, Wedd.
Red Cinchona bark of Lima Red Cinchona bark, true, non-verrucous (*Cascarilla roja verdadera*, Laubert) Red Cinchona bark, true, verrucous	*C. nitida*, Ruiz et Pav.
Orange-red Cinchona bark, verrucous Pale-red Cinchona bark with a white surface Brown Carthagena bark Red Carthagena bark	?

The following, according to M. Guibourt, are the most active barks:—

1. Calisaya Cinchona bark.
2. Yellow orange „
3. Pitaya „
4. Verrucous true red „
5. Non-verrucous true red Cinchona bark.
6. Red Lima „
7. Grey Lima „
8. Verrucous white Huamalies „

(Weddell, *Hist. Naturelle des Quinquinas*, fol., 1849.)

A. CINCHONÆ PALLIDÆ, the Pale Barks, the *quinquinas gris* of Guibourt, are almost always quilled, moderately fibrous, and more astringent than bitter. Their powder is usually of a greyish fawn colour, but sometimes the grey barks are not only produced by several different species, but they very frequently are the young bark of the same trees, which in the older parts yield the yellow and red Cinchonas. They contain *Cinchonia* and little or no *Quinia*. With regard to chemical composition there is also some uncertainty, for it has been fully proved that the same botanical species furnishes barks differing in chemical constituents, according to the influence of age and of local circumstances. An infusion of Pale Bark does not deposit any Sulphate of Lime on the addition of a solution of Sulphate of Soda.

1. CINCHONÆ PALLIDÆ CORTEX, B. Pale Cinchona Bark. Bark of Cinchona Condaminea, DC., *vars.* Chahuargera, *Pavon*, and crispa, *Tafalla*, (B.) Crown or Loxa Bark. Quinquina gris-brun de Loxa, *Guibourt.* China Loxa, *Bergen.* Collected about Loxa, in Ecuador.

This kind of Bark was one of the first introduced into Europe. It is always in quills or cylindrical tubes strongly rolled, usually single, from 6 to 15 inches in length, and varying from 2 lines to an inch in diameter, and from half a line to 2 lines in thickness. The epidermis is entire, of a light or dark grey, sometimes even of a brownish colour, often covered with white crustaceous lichens. The outer surface is marked with numerous longitudinal wrinkles, of little depth, or crossed by transverse cracks, which often run entirely round the bark, dividing it into rings, the edges of which are somewhat elevated. The inner surface is smooth and uniform, and of a cinnamon-brown colour, as is the powder. The middle-sized quills are probably the best. The taste is astringent and bitterish, with a little aroma. The odour is compared by Bergen to that of Tan, but it has a slight degree of aroma. It is imported in chests and serons, and is collected in the woods round Loxa, and on the neighbouring mountains of Peru. There seems no doubt of this being produced by *Cinchona Condaminea.*

Cinchona Condaminea (fig. 76) is a tree about 30 to 45 feet in height, with opposite branches, which are horizontal in the lower parts, but form above an acute angle with the stem, smooth, as high as the inflorescence, with lanceolate leaves, ovate or somewhat roundish, usually acute, above very smooth, shining, below sometimes pitted in the axils of the veins; calycine teeth triangular-acuminate or lanceolate: filaments about half the length of, or longer than the anthers; capsule oblong-ovate, scarcely twice as long as broad. (*Weddell.*) Peduncles panicled, corymbose in the axils of the upper leaves, forming a large loose thyrse, covered with a thick short down. Tube of the calyx downy, like the pedicles; limb very short, urceolate, 5-toothed, pubescent. Tube of the corolla slender, about four times as long as the tube of the calyx, tomentose; limb very shaggy internally. (*Lind.*) See plates 1 and 2, Howard's "Illustrations," *C. chahuargua* and *C. crispa.*

Dr Weddell unites under this head several species of Cinchona of other botanists—under the varieties of, α. *vera*, Loxa. β. *Candollii*, Cuença. γ. *lucumæfolia*, Loxa. δ. *lancifolia*, Peru, Æquator, and New Granada; ε. *Pitayensis*, New Granada. Thus deciding the much-disputed point of the identity or difference of the species growing in New Granada and near Loxa, by uniting the *C. lancifolia* of Mutis, yielding the orange-bark of Santa Fé, with *C. Condaminea* of Humboldt, which grows near Loxa, and yields the *Quinquina de Uritusinga*, or the finest crown bark. He speaks, however, with some diffidence, as he had never seen any of the above varieties growing in their natural sites, and recommends it as very desirable to compare carefully together the barks of these different varieties in individuals of the same age. *C. Condaminea* occupies a belt of vegetation extending from 5700 to 7700 feet (or from 1600 to 2700 metres, *Caldas*) above the sea, having a mean temperature of from 64°–68° Fahrenheit (14°–15° Centigrade, *Caldas*). The variety *C. lancifolia* may be found at as great a height as near 10,000 feet, and whence it must be exposed in cold nights almost to frost. The varieties *chahuargua* and *crispa* have been distinguished by Pavon (MS.) and Tafalla, and figured by Howard.

This, the first known species, was that intended under the name of *C. officinalis.* It was most wastefully cut down before even the year 1779 in Peru, and therefore one of the finest varieties of the Loxa bark, that is, the Cascarilla fina de Uritusinga, is seldom, if ever, now met with in commerce.

Uritusinga formed the choicest bark for the Royal Pharmacy, hence it was called Crown bark. Several kinds of bark are yielded by the different varieties of this species. These chiefly yield Cinchonine, but some contain a small quantity of Quinine. Pitaya bark yielded most Quinine to Guibourt. The barks generally correspond with the *quinquina gris-brun de Loxa* of Guibourt, while others resemble the Crown bark of commerce, also the grey-brown, or rusty-brown, perhaps the *knotty* of Jussieu, including the Chaharquera de Loxa, which is probably the Huamalies of Bergen.

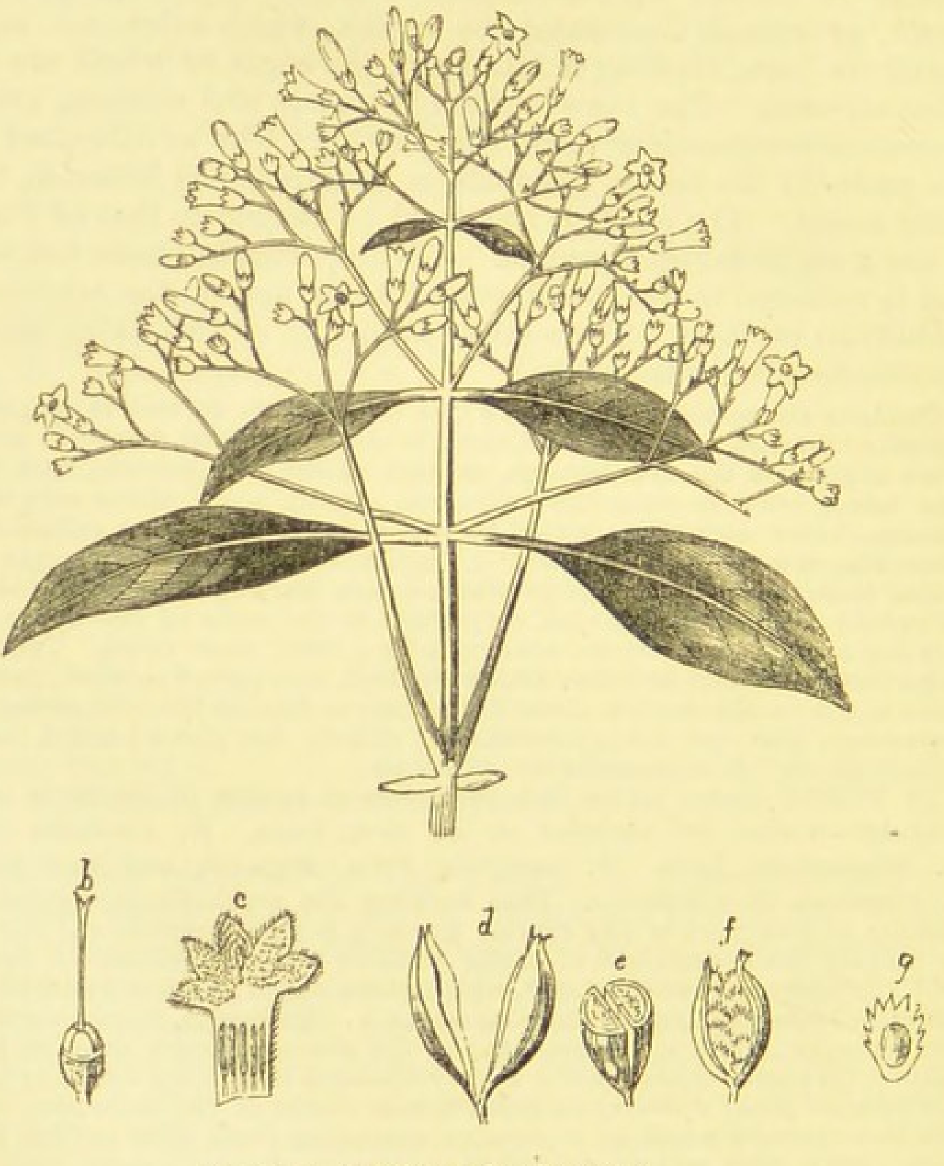

Fig. 76.—Cinchona Condaminea.

Mr Howard found some fine specimens of the Uritusinga or Crown bark, though old, to contain per cent. of Quinine ·714, Quinidine ·514, Cinchonine ·04, even in small quills, while the larger are richer in alkaloids. He therefore concludes that the old Crown bark was rich in the quantity of alkaloids it contained, "which, taking the whole together, for the bark is rich in Cinchonine, and Calisaya is not, equals the sum total of alkaloids in some specimens of good Calisaya bark."

On the contrary, some very fine Crown bark of the present day yielded him only per cent. Quinidine, crystallised from Ether, ·57, Cinchonine ·06, while some fine H. O. bark, which was one of the brands adopted for one kind of Crown bark, and is now applied to the Crown bark of commerce, yielded him per cent. of Quinidine, crystallised from Ether, 1·05, Cinchonine ·08.

The present H. O., or Crown bark, was supposed to be yielded by *Cinchona scrobiculata;* but this has not been confirmed by Weddell's observations, though Humboldt stated that there were very extensive forests of *C. scrobiculata*, and that large quantities of the bark were exported from Payta, the nearest port to Loxa.

(Mr Cross, who is collecting in the district of Popayan for the Indian Government, has lately sent over seeds of the *C. Pitayensis*, which produces red Pitayo bark, "the best of all." Dr Jameson identifies it with the Pitayo bark of New Granada. Specimens of this species, quite distinct from *C. lancifolia*, Mutis, are in the herbarium at Kew. Mr Howard has obtained from this bark the surprising quantity of 8·6 per cent. of alkaloids sol. in Ether.)

Pöppig discovered that the bark called *Cascarilla nigrella* in Peru, and much esteemed there, was obtained from *Cinchona glandulifera* of R. and P. when growing on high mountains near Huanuco and Cuchero. It came formerly from Lima, and appears equal to the finest from Loxa. Mr Howard having compared the specimens of this bark with the H. O. bark of British commerce, concluded that they were identical. Another kind, inferior in quality, called *Cascarilla provinciana nigrella*, is produced by the same tree when growing in warm valleys.

The *Cascarilla fina de Loxa*, also yielded by this species, has been recently imported. Dr Pereira and Mr Howard found fourteen chests of this in 613 packages. The "Silver Crown" and "Leopard Crown" formed a large proportion of other chests. Also the variety with corky coat and silvery epidermis, known as "Silver Crown," and which is probably yielded by the variety γ *lucumæfolia*. Some fine specimens are not unfrequently received from Payta, but are looked upon as verging more upon the rusty Crown than upon the silver Crown barks. The black, or *quina-negra*, has also been imported of late, and, though an inferior bark, is a product of a variety of this species; also the *quina estoposa* (*stupea*, tow) *de Loxa*, or fibrous specimen of *lancifolia*, but which so closely resembles the *fibrous Carthagena*, and of which specimens have come from Payta mixed with ashy crown bark. The barks yielded by *C. Condaminea*, and its variety *C. lancifolia*, belong altogether to the better description of barks, judging by the quantity of the different alkaloids which they contain, and of this there has of late been considerable experience, as owing to the high price of the superior barks of Bolivia, they have been extensively employed in the manufacture both of Quinine and of Cinchonine (P. and H.)

"200 grains of Pale Bark, treated in the manner directed for the test for Yellow Cinchona Bark, with the substitution of chloroform for ether, should yield not less than 2 grains of alkaloids." (B.) Good Loxa bark contains Quinia and Cinchonia, about ½ per cent. of each. The Cinchonia is insoluble in Ether. Both are dissolved by the Chloroform.

2. GREY OR SILVER BARK. Cinchona cinerea. Barks of *C. micrantha* and of *C. nitida*, R. and P. Huanuco Bark. China Huanuco, *Bergen*, Quinquina de Lima, *Guibourt.*

This kind of pale bark was first introduced into Europe about the beginning of the present century. It obtained its name of Lima from the place of export, and that of Huanuco from the city in Central Peru near which it is produced. It resembles the last kind in its dimensions, but is rather longer and coarser. It occurs in quills with a greyish epidermis. Many of the smaller have a more or less complete spiral form, and a large oblique slit is observable at the edge of most of the complete quills. It is less wrinkled longitudinally than Crown bark, and the transverse fissure less generally runs entirely round, with the edges not elevated. On the inside it is rather more of a red colour, more or less uneven and fibrous, but its powder is nearly of the same cinnamon-brown, and similar to it in odour and taste. Bergen says the odour of the bark is like that of clay, and in this respect different from that of all other varieties.

C. micrantha (T. xiv. xv. Wed.) delights, more than any other species which Dr W. has seen growing, in shady and moist places, and in the province of Carabaya near torrents. Its bark is known in commerce under the name of Huanuco bark. One variety resembles the *Calisaya*, and also the orange-coloured Quinquina of Mutis. Other sorts are known as coarse and inferior Huanuco barks of commerce. One kind appears to be the *Pata de gallinazo*, which was gathered by Pöppig in the forests of Cuchero, and obtained from the younger and upper branches of *C. micrantha*, while the *Cascarilla provinciana* is from the larger boughs. This Huanuco bark is often found mixed with the *grey bark* of *C. nitida* mentioned below. "The *C. micrantha* furnishes in Peru the second-rate qualities of *grey bark;* in Bolivia the same tree produces second-rate varieties of *Calisaya*, which pass in commerce as light and flimsy sorts of Bolivian bark." (*Howard.*) The *inferior grey bark* yielded Quinine, ·243, Quinidine, ·28, Cinchonine, 1·25. Total. 1·773 per cent. Bark, G. and K. t. vi. f. 6–8.

The bark of *C. nitida* is not quite so dense, but is more resinous, and the outer coat more even than that of *C. Condaminea.* Mr Howard says, that the bark of *C. nitida*, which is the *Quina cana legitima*, or "genuine grey bark" of Laubert, still keeps its ground, and forms the finest samples in the drug market in England: also that in a recent sale he found in it the following proportion: 30 chests of *C. nitida* unmixed; 100 chests mixed with *C. micrantha;* and from 30 to 40 chests almost all *micrantha.* All this sold as "grey bark," but the *nitida* was reckoned the finest—*C. nitida*. T. x, A. *Wed.*

M. Guibourt identifies it with his *rouge de Lima:* he found it very rich in Cinchonine and in Quinine, as is also the case with commercial red bark. Mr Howard obtained about ·571 Quinine, ·142 Quinindine crystallised, and 1·4 Cinchonine. Total, 2·113 per cent

3. *Ash or Jaen Cinchona*, apparently produced by *Cinchona ovata*, Fl. Per., is distinguished by its thin light coat, readily pulverised, cracks few, quills mostly crooked. Colour dark cinnamon-brown. (*Bergen.*) From one of its names it would seem to come from near St Jaën de Bracomoras. G. and K. t. x. f. 6-9.

Cinchona ovata is thought by some to be a variety of *C. cordifolia*, Mutis, or of *C. pubescens*, Vahl. With the exception perhaps of *C. Condaminea*, no species is more liable to vary with the soil and climate, especially in its bark It is known in Peru under the name of *Cascarilla Carabaya*, where it is collected to adulterate Calisaya bark; and it is probable that several of the barks of Loxa and of Huanuco are produced by this species. Mr G. recognised one as the *q. de Lima gris fibreux*. Dr Weddell thought that this species, his var. *erythroderma*, might yield the *q. q. rouge vrai*. Carabaya bark, a spotted variety, which approaches ashy bark in character, and which has been recently introduced here, has frequently mixed with it what is called Huamalies bark in Germany. One sort of its bark is like "ash bark." Mr H. found in even a poor specimen of ash bark, Quinidine, crystallised, 0·61; Cinchonine, crystallised, 0·86. The prejudice against it, therefore, is unjust. One kind, called ashy crown bark in English commerce, and of which considerable quantities have of late years been introduced, and which is also called *Quinquina Loxa cendré*, is the produce of *C. cordifolia*. Mr H. found in ashy crown bark, of Quinine and Quinidine, 0·457, and of Cinchonine, 0·3 per cent. It is therefore a tolerably efficacious bark, and large quantities have of late been sold for pharmaceutic purposes.

4. *Huamalies or Rusty bark* (of Guibourt) comes from Lima, and is the produce of *C. pubescens*, Vahl. (the *C. purpurea* of Fl. Peruv.); it is distinguished by its coat, thin and spongy longitudinal wrinkles and wart-like elevations, which penetrate to the cortical layers; under surface even; colour red-brown. G. and K. f. 1-5. (*Bergen*, as given by Pereira.) Yielded to Göbel and Kunze 3·8 per cent. of Cinchonia, and 2·8 per cent. of Quinia.

The Huamalies is one of the better and more efficacious barks; but it might be arranged with the red barks. The Huamalies district is unexplored, and the source of this bark therefore unknown. Mr Howard thinks that the *Cinchona Chaharquera* of Peru is very near to, if not identical with, the Huamalies bark. This is made a variety of *C. Condaminea*.

5. White Loxa bark is sometimes found intermixed with the Crown or Lima Cinchona, but it is to be distinguished by its white epidermis.

B. CINCHONÆ FLAVÆ. Yellow Barks.

6. CINCHONÆ FLAVÆ CORTEX, B. Yellow Cinchona Bark. Cinchona Calisaya, *Weddell.* Quinquina jaune royal, *G.* König's China. *Bergen.* Royal Yellow Bark. G. and K. t. viii. f. 1-6. Collected in Bolivia and Southern Peru.

The Yellow Bark of commerce appears to have been first introduced into Europe about the year 1790. The tree producing it was till very lately unknown, the usual reference to *C. cordifolia* of Mutis being erroneous. Yellow bark is imported from southern ports, such as Coquimbo, as originally stated in the United States Dispensatory, but chiefly from Arica, whence it is sometimes conveyed to Lima. Yellow bark is produced in hot forests, growing on steep and rugged mountains at elevations of 5000 and 6000 feet, between 13° and 16° of S. latitude, in Bolivian provinces to the eastward of La Paz and in the Peruvian provinces of Carabaya, and is known there by the names of *Cascarilla Colisaya* and *Calisaya*. (Colli-salla, *Pöppig.*) It is imported in chests and serons, and two kinds are known, *quilled* and *flat* Yellow Bark.

The *quilled*, called *Calisaya rolada*, or *rolled*, is in pieces from 3 and 4 to 18 inches in length, and from ¼ to 2 or 3 inches in diameter, and varies in thickness from ⅛ to ⅓ of an inch, in general only singly quilled. The epidermis is brownish, often mottled by whitish or yellowish lichens, marked by longitudinal and transverse fissures, and generally easily separated from the bark ; sometimes in the larger pieces very rough from the furrows and cracks. Its inner surface is smooth but fibrous, and of a yellow cinnamon colour. The transverse fracture is short but splintery, and the powder contains spiculæ which are irritating to the skin. The *flat* Calisaya, or *Calisaya plancha*, appears to have been derived from the trunk and larger branches ; it may be quite flat or slightly curved, and being destitute of epidermis, is of a yellowish colour on both sides, but more fibrous in structure. The powder is of a yellow orange-colour ; taste less astringent, but more bitter than the pale bark : that of the flat bark is less bitter than the quilled. Yellow bark contains a large proportion of Quinia, and very little Cinchonia. Sulphate of Soda produces an abundant precipitate of Sulphate of Lime in its infusion.

In recent importations of Calisaya bark from Bolivia, Mr Howard has observed a large admixture of the root bark of the tree. Its *curly* shape enables it to be recognised at once. Its collection is ruinous and destructive to the Cinchona forests : its being passed off for the stem bark is a fraud on the consumer. Mr Howard found on the examination of one of the best specimens only ·81 per cent. of alkaloids, half of which was Quinidia. The bark of the stem is thus about ten times more valuable. (Dr de Vry, however, questions these conclusions. P. J. June, 1864.)

Yellow Bark contains from 2–4 per cent. of Quinia. The B. P. gives a quantitative test, in which the alkaloid is extracted by H Cl, the colouring matter precipitated by the cautious addition of subacetate of Lead, and the Quinia, separated by caustic Potash added so as nearly to redissolve the precipitate, is dissolved out by shaking with ether. It should weigh at least 2 grains for 100 of the bark, and be readily soluble in dilute $S O_3$.

Cinchona Calisaya.—Leaves oblong or lanceolate-obovate, obtuse, attenuated at the base, rarely acute on both sides, smooth, polished, or pubescent beneath, scrobiculate in the axils of the veins. Filaments usually shorter than one-half the length of the anthers. Capsule ovate, scarcely equal in length to the flowers. Seeds frequently fimbriate-denticulate at the margin.

There are two varieties of this, which is the most valuable species of Cinchona, because yielding the yellow bark of commerce.

α. Calisaya vera.—A tall tree, with obtuse, oblong, obovate, or oblong-lanceolate leaves. Trunk straight or bent, naked, not unfrequently twice the thickness of a man's body. The leafy head (*coma*) for the most part elevated above all the other forest trees.

Bark of the trunk thick. The periderm mostly thicker than in any species of the genus, easily separable from the liber, and, when separated, exposing on the surface of the latter furrows or impressions resembling carvings; furnished with vertical parallel fissures, and transverse, more or less annular markings; whitish or also blackish. Periderm of the branches whitened or variously marbled by the thalli of lichens; and marked by rather sinuated fissures and narrower markings. Bark of the branchlets thin, smooth, and brownish olive-coloured or blackish. It grows in declivities and steep and rugged places of the mountains, at an altitude of from 5000 to 6000 feet, in the hottest forests of the valleys of Bolivia and Southern Peru: between 13° and 16° 30′ south latitude, and from 64° to 70° west longitude ; in the Bolivian provinces near La Paz of Enquisivi, Yungas, Larecaja or Sorata, and Caupolican or Apolobamba; and in the Peruvian province of Carabaya. It flowers in April and May.

Fig. 77.—Cinchona Calisaya.

A. Fructiferous branch. (From a specimen collected by Weddell in the province of Carabaya, in Peru. B. Flowers. C. Corolla laid open (magnified in proportion). D. Capsule (magnified in proportion.) E. Seed (magnified in proportion. F. Leaf of var. *Josephiana*. (From a specimen gathered in the provinces of Yungas, in Bolivia.)

β. *Josephiana*.—A shrub with somewhat acute, oblong-lanceolate, or ovate-lanceolate leaves; 6 to 10 feet high, with a slender branched trunk of from three to five centimetres thick. Branches erect. Bark adhering firmly to the wood; that of the trunk and branches schistaceo-blackish, smoothish, or furnished with different lichens, and marked in an annular manner by some narrow, distant scissures; that of the branchlets reddish-brown.

This variety is called both *Ichu Cascarilla* and *Cascarilla del Pajonal*, both names signifying herbaceous Cinchona. Dr Weddell, after careful study, determined that this was a variety, and not a distinct species. He has frequently observed it, for instance, on the mountains of Tipoani, and in passing from a *pajonal*, or meadow, to a cut wood, and thence to a thick forest, has seen the various modifications which the *Ichu Cascarilla* assumes in form and appearance. The colour and texture of its different parts indicate the influence of local circumstances. Hence the coriaceous leaves, with highly-coloured nerves, and stiff petioles; or, on the contrary, the soft and velvety green leaves which distinguished the *Cinchona Calisaya*, and the flaccid petioles. Finally, when the summit of the adult plant rises above the neighbouring trees, its organs reassume some of the characters of the *Ichu Cascarilla*. The external surface of the bark, when bruised, exudes a yellowish gum-resinous matter, bitter and astringent. It is this which fills up the cells of the derm, and which escapes from fissures in the young bark. The consistence of the bark, when first removed from the tree, may be compared to that of a mushroom, and it may be broken with the greatest facility in any direction. When the dry bark, as met with in commerce, is handled, a multitude of little prickles run into the skin, and form one of the distinguishing characteristics of good yellow bark.

OTHER YELLOW BARKS.

7. *Hard Carthagena Bark*, China flava dura, *Bergen*, the *Quina jaune* of Humboldt, the *Quina amarilla* of Mutis, and the produce of his *Cinchona cordifolia*, which grows in the forests of New Granada, is that which has been mistaken for the foregoing yellow Calisaya bark. G. and K. t. ix. fig 1–4. It is distinguished by its epidermis being velvety, greyish-white, thin, and soft, or warty, longitudinal furrows irregular, few transverse fissures; under surface uneven or splintery; colour dull citron-yellow. (*Bergen.*) Göbel and Kirst obtained in ℔j. about 56 grains of Quinia in this and the following, and of Cinchonia 43 grs. in the former, but none in the fibrous bark.

8. *Fibrous Carthagena Bark*, China flava fibrosa. G. and K. taf. ix. fig. 5–8. Occurs with the foregoing, whence Dr Pereira suspects it may be produced by the same species, either in different seasons or in different localities. Coat thin, soft, of moderate thickness, or rubbed off; under surface even, but rough to the touch; colour pure ochre-yellow.

C. cordifolia of Mutis includes the *C. rotundifolia* of Lambert and Lindley. It is found both in New Granada and in Peru, in moist and shady woods at altitudes of from 4000 to 7000 feet, throughout almost the whole of the Cinchona regions. It is also the most northern in its distribution, having been found near Caraccas; but it was also discovered near Santa Fé de Bogota, where it yields the barks known as *hard Carthagena barks* in English commerce. This name is applied to the produce both of *C. lancifolia* and of *C. cordifolia*. When the produce of *C. lanceolata* is shipped from a port on the Pacific, this, from its resemblance to *C. lancifolia* bark (the *Quina estoposa* de Loxa), is also called Carthagena bark. The Carthagena barks of Mutis have, in consequence of the high price of Bolivian, been extensively tried, and found to be possessed of active properties, and useful for separating the alkaloids.*

9. *Orange Cinchona of Santa Fé.* Quinquina de Carthagene spongieux, G. l. c. p. 78, is the *Quina naranjada* of Mutis, and produced by his *Cinchona lancifolia*, which is so frequently stated to be the species yielding only pale bark.

10. *Cuzco Bark*, first described by Guibourt, is the *China rubiginosa* of Bergen, and may by some be mistaken for Yellow Calisaya bark. Its epidermis is shining, pale grey, without fissures; the naked surface is orange-red. But Dr Pereira has pointed out that it may be distinguished by Sulphate of Soda not producing any precipitate in its solution. Guibourt obtained of Cinchonia about gr. lx. from a pound of bark.

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* They will probably come into use more and more every year, as the Calisaya forests become exhausted. It appears (p. 513) that some contain less Quinia than Quinidia, but it is probable that in course of time the latter alkaloid will be acknowledged to be of equal efficacy with the other. Dr Bailey, the American government inspector of drugs, acknowledges that up to the year 1849 he condemned upwards of 300,000℔. of Carthagena and Maracaibo barks presented at the port of New York, as spurious and worthless! Many different barks are produced in the New Granada district, and there is now a thriving Quinine manufactory established in that country. (For some remarks on the value of the barks of Central America, see a Memoir by MM. Delondre and Bouchardat, translated in P. J. xiv. 77, 165, 513, 570.)

What is called Cuzco bark in Peru, is the produce of *Cinchona scrobiculata*, and is of little value. Another kind is yielded by *C. pubescens* var. *Pelleteriana* of Weddell; but what is chiefly known in English commerce by that name is yielded by *C. pubescens* var. *purpurea*.—P.

C. pubescens, though resembling, is yet very distinct from *C. cordifolia.* It is one of the species which was included under *C. officinalis;* and is found in the lower forests of the mountains of Peru and of Bolivia, between 4° and 16° of S. latitude, near Santa Anna de Cuzco and in Carabaya.

C. pubescens var. *B. purpurea.*—Weddell, the *C. purpurea* of Pavon. This bark is of a light grey, or dark brown, with a few warts and wrinkled epidermis; sometimes found in commerce, being of comparatively little value, is used for adulteration. In the province of Carabaya, Dr Weddell found it called *Cascarilla* or *Quina amarilla*, the name which Mutis gave to his *C. cordifolia.* "The two barks are extremely alike."—W.

Its bark was recognised as that from which the alkali *Aricina* was obtained; but this some consider to have been only *Cinchonine* modified by the process of extraction. It is described by the name of *Quinquina de Cuzco* by M. Guibourt. It contains both Quinine and Cinchonine, but only in small quantity.

The *Cascarilla boba* (fool's or worthless bark) was supposed to be Huamalies bark by Reichel, who examined the barks brought by Pöppig, but he seems to have been mistaken in their identification; it is yielded by a variety of *C. Condaminea.*

C. Cinchonæ Rubræ, or Red Cinchonas.

11. Cinchonæ Rubræ Cortex, B. Cinchona succiruba, *Pavon* MS. (B.), or *Cinchona ovata.* Red Cinchona Bark. (Collected on the western slopes of Chimborazo.) Rothe-China, *Bergen.* Quinquina rouge, or Cascarilla colorada of the Spaniards. G. and K. t. xi. f. 1–5. Howard, plate 9.

Red Cinchona Bark was early known, but not distinguished in England until 1779. It is imported from Lima in chests, but the species yielding it was long unknown. *C. magnifolia*, Fl. Peruv., the *C.* (now Cascarilla) *oblongifolia* of Mutis, yields a different and inferior kind of bark, *Quina nova*, the purple red Cinchona of Santa Fé. No. 12.

Red bark is usually imported from Guayaquil, but also from Payta. The districts where it is produced are near to Guayaquil, but it also comes from near Jaen, farther to the south. M. Guibourt was of opinion that the *red* colour was not peculiar to any one species of bark, but that it depended on accidental circumstances, as exposure, the art and mode of drying. Dr Weddell's observations to some extent confirm this view. He has observed the red shade in the bark of *C. ovata*, also in *C. scrobiculata*, in *C. pubescens*, and even in *C. Calisaya;* and he believes that the yellow and red barks of Loxa are furnished by varieties of the same tree. The observations of La Condamine, of J. de Jussieu, of Caldas, as well as of Humboldt, lead to the same conclusion; it is possible, therefore, that the differences of colour may not be characteristic of any particular species. Dr Pereira and Mr Howard, in their examination of the barks of Peru, found one (No. 45) which was labelled "*Quina Colorada del Rey de Loxa*," also "*Cinchona Colorada de Huaranda*," stated to be the produce of *Cinchona succirubra* of Pavon's MS. It is quite like commercial red bark; the coat is like that of *Conda-*

minea, but easily detached (some pieces are quite deprived of coat), and showing various *crater-like* elevations and depressions such as occur on red bark. The substance brown, red, brick-coloured. The transverse cracks rather distant. Mr Howard observed that "The *Cinchona succirubra* (red juice), whatever its botanical origin, is, I think, commercial red bark."

Cinchona succirubra was described by Pavon as the species yielding the red bark of commerce. It is found in the forests at the foot of Chimborazo, in the republic of Ecuador. Mr Howard has described the bark of this tree as the true red bark, though in 1855 he examined the specimen of Ruiz and Pavon at Kew, and determined it to be *C. ovata*. The accompanying cut is taken from Howard's *Illustrations*.

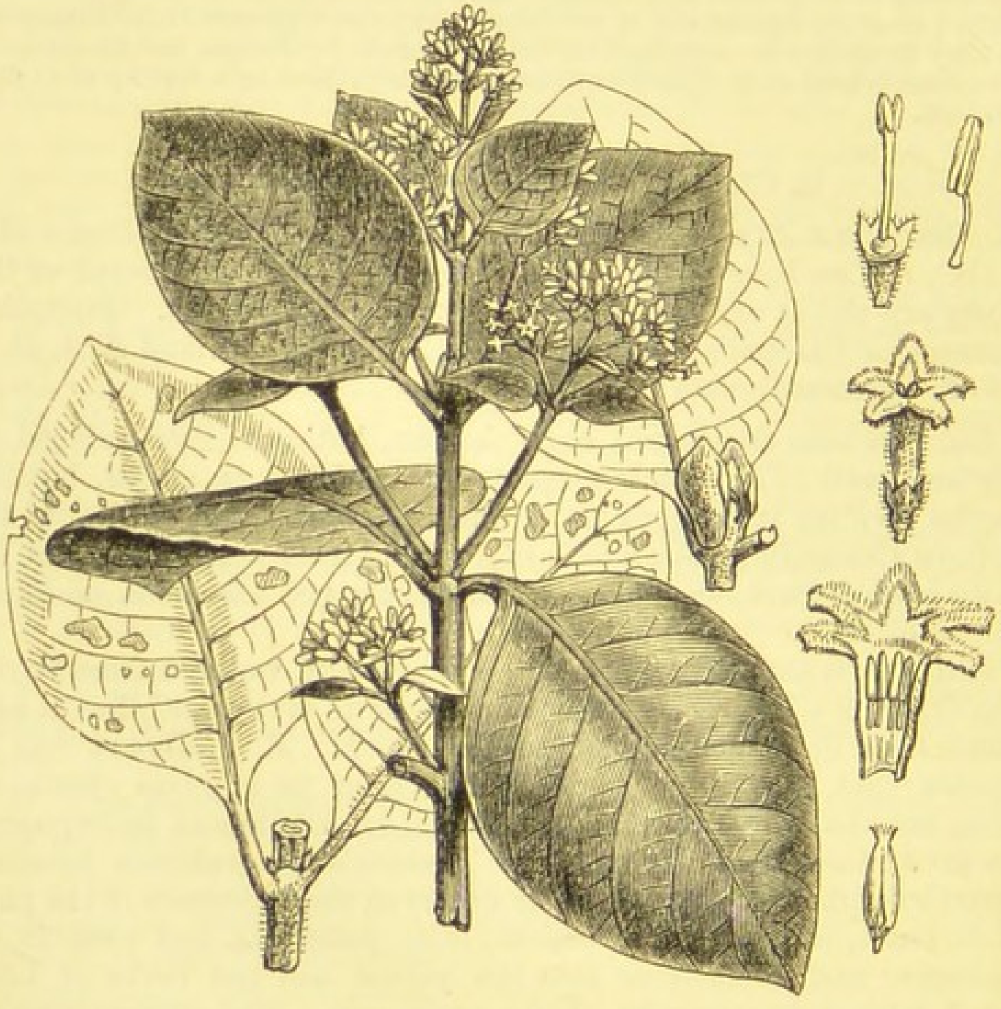

Fig. 78.

Cinchona succirubra, Pavon MS.—A tree with solitary erect trunk, sometimes two or three springing from the same root, very leafy and branched. Wood compact. Bark brown, with some white spots, and transverse horizontal furrows. Leaves opposite stalked, ovate-oval, entire, shortly pointed, glabrous, slightly shining, strongly veined, the younger ones reflexed at the margin. Stipules subamplexicaul, oblong, sessile, deciduous. Fl. in paniculate racemes; handsome, reddish pink; petals ciliated, appearing in July and August. Capsule oblong, slightly curved, bivalved, parted at the base.

Habitat.—Cool places at the base of hills, on the slopes of St Antony, road to Huaranda, province of Quito. (When the bark or wood is cut, a milky juice flows out, which soon turns to intense red, whence the local name *Cascarilla colorada.*)

In his Voyage dans le Nord de la Bolivie, published in 1853, Dr Weddell, speaking of the port of Guayaquil, states that the true red bark is produced by the forests of that region. The tree grows on the western slopes of Assuay and Chimborazo between Chillanes and Guaranda. The stem, leaves, and bark of this tree were sent to Mr Howard from this district in 1856. From the cut and description (P. J. xvi. 209) of the leaves, they appeared to be those of the variety of *C. ovata*, called *erythroderma* by Weddell.

Red Bark is received in quilled, but most frequently in flat or rather curved pieces, varying in length from a few inches to two feet, from one to five inches in breadth, from a quarter to three quarters of an inch in thickness. The pieces are usually covered with epidermis, which is of a greyish or reddish-brown colour, sometimes mottled with purple or with white from adhering lichens, though these are less frequent than in others ; but it is often rough, wrinkled, and warty, forming the variety *verruqueux* of G. On the inside its surface is coarsely fibrous, and of a deep cinnamon-brown, but it looks of a red colour when placed near the other barks, and especially in the thicker pieces. The fracture is short, fibrous, and splintery. The powder is of a reddish-brown colour ; the taste is powerfully bitter, with a slight degree of aroma. It is more scarce than the other kinds, and is remarkable for yielding both Quinia and Cinchonia. 100 gr. tested in the same manner as Pale Bark, should yield at least 2 per cent. of alkaloids. (B.)

12. *Red Cinchona of Santa Fé.* (Per.) *Quinquina nova* of authors. *Quina roxa* or Azahar of Santa Fé. An inferior kind of Carthagena Bark of a red colour, with white epidermis, containing little or no Quinia or Cinchonia. It is produced by *Cascarilla* (formerly *Cinchona*) *magnifolia*, Fl. Per. *C. oblongifolia*, (Mutis, G. and K. t. xi. f. 6 to 9.) (The genus *Cascarilla* has been separated from Cinchona by Weddell.)

13. Red *Cinchona*, with a white micaceous epidermis, mentioned by Guibourt and Pereira.

ACCLIMATISATION OF CINCHONA.

Cultivation of Cinchona in the Dutch possessions.—A few years after Dr Weddell's return to Europe, the Dutch Government directed its attention to the introduction of the Cinchona trees into Java. The governor of Java sent Mr Hasskarl to Peru and Bolivia. After a residence of two and a half years he obtained 400 plants of the *C. Calisaya*, which were forwarded from the port of Islay to the island of Java, and arrived there in 1853. They were planted in the mountainous country near Bandong. Dr de Vry, the chemical inspector, reported in 1860 that the trees were in flourishing condition (half a million or more were planted out), had grown to a height of sixteen and a half feet, and produced thousands of fruits, the seeds of which had germinated. He had obtained bark which yielded 4 per cent. of alkaloids.

Cultivation of Cinchona in the British possessions.—Though the Dutch were the first to succeed in the acclimatisation of the Cinchona, the persevering efforts of the Government of British India have at last been rewarded with success, and plantations of these valuable trees are now flourishing on the Neilgherry hills and elsewhere in India. In 1856 Dr Royle, who had the supreme control of the Botanic Garden of India and supervision of its vegetable products, under the East India Company, expressed his confident hope of the ultimate success of the endeavours which were then being made to introduce these trees in the mountainous districts of India, whose climatic conditions approximate so closely to those of the slopes of the Andes. Mr Fortune took a small number of Cinchona plants from the Botanical Gardens of Edinburgh and Kew to India in 1853; but as these died, Mr Markham was sent from England in 1859 to procure the *C. Calisaya* and other species. He started from Arequipa in Peru on March 12, 1860. After a toilsome journey, in which he failed to penetrate into Bolivia, he obtained upwards of 500 of the young Calisaya trees on the eastern Cordilleras within the Peruvian frontier. These were taken to Southampton by the Isthmus of Panama; 73 were broken in the passage across the Andes to Islay; about half of the remainder perished in the long voyage. The rest were forwarded in glass cases by the overland route to India, but when they arrived they were all dead. Mr Markham was unable to obtain seeds from Bolivia, on account of the jealousy of the government. He brought none from Peru, as at that season of the year they were not ripe. He left directions, however, with agents in Peru and Ecuador, that they should send seeds and plants to him in India. In the spring of 1861 living plants and seeds were received by Mr M'Ivor at the garden of Ootacamund. In August 1862, 100,000 healthy plants were rooted; in October 1863, 250,000. (*See* Markham's Travels in Peru and India, 1862, also Pharm. Journ. 1861–1863.) Many seedlings have been sent to India from the nursery at Kew. The plants growing on the Neilgherries are *C. Calisaya*, *C. Condaminea*, *C. micrantha*, *C. nitida*, and *C. succirubra.* The last (red bark) was grown from seeds sent by Mr Spence from Chimborazo. It is being cultivated by Dr Anderson at Darjeeling in Sikhim in the Bengal Presidency, and cases of ague and fever have already been cured by its bark. *C. succirubra*, *Calisaya*, and *micrantha*, are being cultivated by Mr Thwaites with much success in Ceylon. 2·8 per cent. of the alkaloids have been obtained by De Vry from the bark of the *C. succirubra* cultivated in India. Mr Howard has reported 3·30–3·40 per cent. of alkaloids in specimens sent to him for analysis by the Secretary of State for India.

Since 1863 the cultivation of the Cinchonas in India has been immensely extended, and already British India bids fair to compete, at no distant period, with Central and South America as a source of Quinine.

The cultivation of Cinchona has been successfully undertaken in

Jamaica, under the auspices of Dr Daniell. A grant of young trees from the nursery at Kew has been recently made to the French government, which is anxious to introduce the plant into Algeria.

The area over which the cultivation of Cinchona is extended cannot possibly be too wide. The supply of a drug so important to Europe, and which to some parts of the world is a necessary of life, must not be suffered to depend upon a few forests in America, or be at the mercy of reckless cultivators or selfish governments.

Chemistry of Cinchona.

The physical characters of the Cinchona barks are chiefly important as indications of their richness in the principles which make them so valuable as medicinal agents. In 1802, so little was known of these, that Seguin concluded that the active principle was of the nature of Gelatine. In 1803, Dr Duncan detected a new principle, which he named Cinchonia, and which was isolated by Gomez in 1810. And in 1820, Pelletier and Caventou discovered Quinia, proved that this and Cinchonia were alkaloids, combined with Kinic acid, and further cleared up the chemical constitution of the barks. Subsequently, Pelletier and Coriol discovered a third alkaloid, Aricina, in Cuzco bark; and during the last few years Quinidia, discovered by Winckler (but first indicated in 1832 by M. Henry), has been added to the list.

The chemical constituents of the Cinchona barks will now be briefly noticed in succession. The list comprises four alkaloids, five acids, and seven other ingredients. The alkaloids are:—*Quinia*, *Cinchonia*, *Quinidia*, and *Cinchonidia*. The acids:—*Kinic*, *Sulphuric*, a variety of Tannic acid called *Cincho-tannic*, an acid called *Cincho-fulvic* or *Red-Cinchonic*, and *Kinovic* acid. Besides these there are generally found a *Fatty matter*, some *Volatile oil*, and *Salts of Lime*, along with *Resin*, *Starch*, *Gum*, and *Woody fibre.*

Quinia, or Quinine, is contained in the largest quantity in Yellow bark; exists also in the Red barks; but is found only in small amount, or not at all, in the Pale barks. Its formula, following Liebig, is $C_{40}\ H_{24}\ N_2\ O_4$. This formula had been confirmed by Regnault and others, but is disputed by Laurent. (The numbers assumed by Liebig are half the preceding. Assuming the commercial sulphate to be a proto-salt, his formula has to be doubled.) This important base exists in the barks chiefly as Kinate of Quinia, but partly in combination with the other acids of Cinchona. It may be obtained by precipitating with Ammonia a solution of its Sulphate. When thus obtained, it is a white powder, but with very great care it may be crystallised from its alcoholic solution in minute silky needles. (Cinchonia and Quinidia may be separated from it by the much greater ease with which they crystallise, or by means of their less solubility in Ether.) It is without odour, but has a very bitter taste. Whether amorphous or crystallised, it is a hydrate, and loses its water on the application of heat. It then fuses, and is afterwards entirely destroyed. It is comparatively insoluble in cold water, but dissolved by 200 parts of boiling water. It is very soluble in Alcohol and Ether. Its solutions have an alkaline reaction. It forms salts with acids, which are more or less soluble in water, alcohol, and ether, and are distinguishable by certain tests. Most of these salts contain 1 equiv. of the base to 1 of the acid. They are more insoluble than the persalts. A solution of a salt of Quinia yields a precipitate of the alkaloid on the addition of Ammonia or Carb. Soda, and of Tannate of Quinia with solutions containing Tannic acid. The reaction with the Chlorine test, discovered by Brandes, is characteristic of Quinia. If to one of its solutions some Chlorine water be first added, and afterwards Ammonia, an emerald-green colour is produced. A solution of a salt of Cinchonia produces a white precipitate with these reagents. A solution of Quinidia is unaltered. Dr Vogel has observed some other reactions of the same kind, which he considers to be also highly characteristic of Quinia. He states that if Potash is added to the Quinia solution and Chlorine water, a sulphur-yellow colour results; or if, instead of this, a strong solution of Ferrocy. Potassium, a dark red is produced, which after some hours passes into green. These changes do not occur with Cinchonia. Another good test is that of Dr Herapath. If Quinia be dissolved in a few drops of warm Acetic acid containing a minute proportion of $S\ O_3$, and the resulting solution be mixed with a drop or two of a weak alcoholic solution of Iodine, there will be formed on cooling some minute green crystals, which strongly polarise light. They consist of Sulphate of Iodo-Quinine. (*See* QUINIÆ SULPH.)

[Van Heyningen has used Oxalate of Ammonia as a test to distinguish Quinia from the other Alkaloids. It produces a crystalline precipitate after standing some time, even in a solution of 1 part in 800. It also precipitates a concentrated solution of Cinchonia, but not one of Quinidia or Cinchonidia.]

Cinchonia (or Cinchonine) exists in Pale, Grey, and Red barks. Formula $C_{40}\ H_{24}\ N_2\ O_2$, containing two atoms of oxygen less than Quinia. Like Quinia it is white and colourless, has an alkaline reaction, a bitter taste, forms with an atom of water a crystalline hydrate, and unites with acids to form crystalline salts. It is far more insoluble in water even than Quinia, requiring 2500 parts of cold, or 1500 of boiling water. It is also nearly insoluble in Ether. Its salts are more soluble in water than those of Quinia. It likewise differs from the latter alkaloid in crystallising with facility from an alcoholic solution in 4-sided prisms. Its reaction with the Chlorine test is different from that of Quinia. Ferrocyanide of Potassium may also be used as a test to distinguish Cinchonia and Quinia. The precipitate formed in a solution of Quinia is dissolved by an excess, that with Cinchonia remains undissolved. If the precipitated solution of Cinchonia be heated, the Ferrocyanide dissolves. If it be then allowed to cool, there is a dense precipitate of flat crystalline plates. (Bill.)

Quinidia, called also Quinidine, and Beta-Quinine, was discovered some years since by Winckler in a bark resembling Huamalies, and in Maracaibo bark. It is found in large quantities in the cheap barks lately imported from New Granada. Fibrous Carthagena bark, the produce of *Cinchona cordifolia*, contains most of it, but it may also be obtained in less quantities from most of the barks of Peru and Bolivia. It exists in company with resin and with *Cinchonidia* in the substance called *Quinoidine*, or *Amorphous Quinine*, which is left as an uncrystallisable residue in the fluid from which Sulphate of Quinia has been obtained.

It is said by Van Heijningen to be isomeric with Quinia, which it also resembles in its alkaline reaction and bitter taste. It is soluble in the cold in 1500 parts of water, 45 of absolute alcohol, and 100 of ether; at boiling temperatures, in 750 of water, and 3·7 of alcohol, being deposited on cooling. It may be separated from Quinia by its property of crystallising readily from an alcoholic or ethereal solution, in large clear rhomboidal prisms. Its salts very much resemble those of Quinia. It forms a basic sulphate similar to *Quiniæ Sulph.*, but probably differing from it in the amount of water of crystallisation. It is rather softer and more woolly in appearance than the latter salt, from which also it differs in being about eight times more soluble in boiling distilled water. (*See* QUINIÆ SULPH.)

Cinchonidia, the fourth alkaloid, is isomeric with Cinchonia. In 1853 M. Pasteur found in commercial *Quinidine* two distinct alkaloids. (1.) Quinidia is isomeric with Quinia, turns green with Chlorine and Liq. Ammoniæ, and rotates to the right the plane of polarised light. (2.) Cinchonidia does not turn green with the above test, and rotates polarised light to the left. He found Quinidia to be the Beta-Quinine of Van Heijningen. As the hydriodate of Quinidia requires 1250 parts of water for its solution, this acid (H I) will precipitate the alkaloid in minute cryst. of hydriodate from the tincture of the bark which contains it. Care must be taken not to add the hydriodic acid in excess. (De Vry.)[*]

[*Aricina*, or Cusconia, was announced by Pelletier to exist in Cusco bark. Its existence as a distinct base is denied by M. Guibourt, who considers the supposed Aricina to be merely impure Cinchonia (?) It was said to have the formula $C_{40} H_{24} N_2 O_6$, containing two more equiv. of Oxygen than Quinia. It was found to be soluble in Ether, and to turn green with Nitric acid. Mr Howard has obtained it from the bark of *C. Pelletierana*, and considers it quite distinct from the other alkaloids of the Cinchonas.]

From the remarkable resemblance in properties between the above alkaloids, some chemists have been inclined to refer them all to a supposed base, *Quinogen* ($C_{20} H_{12} N$), of which Cinchonia, it is thought, might be a Protoxide, Quinia a Deutoxide, and Aricina a Tritoxide. It is, perhaps, to be objected to this that the existence

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[*] The description of Cinchonidia applies to most of what is sold as Quinidia. Pasteur has also described two artificial bases, *Quinicine* and *Cinchonicine* produced severally by heating Quinia and Cinchonia under certain conditions, and isomeric with them. (Comptes Rendus, xxxvii. 162.)

of Aricina is uncertain; and, moreover, that some late analyses of the Cinchona alkaloids, some made by M. Laurent, others by Mr Leers, would seem to indicate a different set of formulæ than those which have been hitherto adopted. These formulæ may be thus contrasted:—

	Liebig and Van Heijningen.	Laurent and Leers.
Quinia	$C_{20} H_{12} N O_2$	$C_{38} H_{22} N_2 O_4$
Quinidia	$C_{20} H_{12} N O_2$	$C_{36} H_{22} N_2 O_2$
Cinchonia	$C_{20} H_{12} N O$	$C_{38} H_{22} N_2 O_2$
Aricina	$C_{20} H_{12} N O_3$	

According to the second set of formulæ, the alkaloids must differ more in chemical construction than is usually supposed, and their basic salts must be regarded as neutral. Strecker, however, strongly affirms the correctness of the formulæ of Liebeg.

A volatile oily base, called *Quinoleine*, may be obtained by distilling any of the Cinchona alkaloids with caustic potash. It somewhat resembles Conia; has a peculiar smell, and contains no Oxygen. It has not an alkaline reaction, though it combines with acids.

Kinic acid, with which the greater part of the alkaloids is probably combined in the barks, is an acid somewhat resembling Acetic, soluble in 2 parts of water, also in alcohol and ether, and crystallising like Tartaric acid. Its formula is $C_{28} H_{20} O_{20}, 2H O$.

Sulphuric acid is contained in small quantities in most of the Cinchona barks.

Cincho-tannic acid is a modification of common Tannic acid. Like the latter, it precipitates solutions of Iron, of Emetic Tartar, and of Gelatine. But it differs from it in its formula, which is said to be $(C_{14} H_6 O_7 + 2 H O)$; in its salts being rather more soluble than those of Tannic acid; and in a peculiar property which it possesses of absorbing Oxygen, and of changing thereby into an insoluble red matter, Cincho-fulvic acid. It precipitates Iron of a green colour.

Cincho-fulvic acid, called also Red Cinchonic′, or Cinchona red, is nearly insoluble in cold water, but slightly soluble in alcohol and ether. Its solutions precipitate Tartar Emetic, but not Gelatine. It gives the colour to most barks, and is soluble in alkalies, forming an intensely red solution. It has the composition $C_{12} H_7 O_7$.

Kinovic acid $(C_{12} H_9 O_3)$ was first discovered in *Cinchona nova*. It was supposed by Batka to be contained only in those false Cinchonas which are yielded by the genus *Buena*. But Schwartz and Winckler have found it in the genuine Cinchonas. It something resembles Stearic acid, being, like the last acid, insoluble in water. It is very soluble in alcohol and ether. Solutions of its alkaline salts precipitate Acetate of Lead and Chloride of Mercury.

By long boiling in water, Cinchona bark is exhausted of its alkaloids, and of the Kinic and Cincho-tannic acids. If this exhausted bark be treated with liquid Ammonia, Cincho-fulvic and Kinovic acids are dissolved out of it. On the addition of Hydrochlor. acid they are both precipitated, and they may then be separated by boiling them with milk of lime, the Kinovate of Lime being soluble in water, the Cincho-fulvate insoluble. (Winckler.)

Besides the alkaloids and acids, Cinchona bark contains certain other vegetable principles. A thick *Volatile Oil*, with an acrid taste and the peculiar odour of the bark, has been obtained from it. Also a concrete *Fat*, capable of forming soaps with alkalies. *Salts of Lime* have been found in the greatest quantity in those barks which yield most Quinia, as the Calisaya bark. *Gum* has been observed to abound most in those which yield most Cinchonia, as the Pale barks, and to be deficient in the Yellow and Red barks, whence it has been inferred that the latter are produced by the older parts of their respective trees. *Resin* and *Starch* are contained in various proportions. The bulky residue of the bark consists of *ligneous fibre.*

When subjected to dry distillation, Cinchona bark yields with the usual empyreumatic products a resinous powder of a bright carmine colour, which Grahe considers characteristic of the bark, and in some measure a test of the amount of alkaloids contained in it. (Cinchonia, heated with Chlor. Mercury, yields a brownish-red substance, soluble in alcohol. Kæchlin.)

CINCHONOMETRY.

Under this term are included the means which have been adopted of determining with accuracy the exact proportion of the active principles in a given specimen of Cinchona bark, a determination which is not easy, but which is important alike to the physician and to the pharmaceutical chemist. There are several rough methods of Cinchonometry. It is known to English manufacturers of Quinine that those barks which yield most of this alkaloid, as the Calisaya bark, contain so much *Lime* that a strong infusion will yield a precipitate with a solution of Sulphate of Soda. This is therefore adopted as a simple and efficient test of their quality. Again, it is generally found that the best Cinchona barks contain a considerable quantity of *Tannic acid* (or Cincho-tannic), an astringent ingredient which further heightens their remedial efficacy. In this way the tests for this acid become to a great extent tests of the quality of a specimen of bark. By a law in Sweden every bark imported is tested by a solution of Gelatine, and one of Tartar Emetic. A third and more direct mode of ascertaining the value of a bark consists in the use of an infusion of galls, the tannic acid in which causes precipitates of *the alkaloids* from a strong decoction.

By the appearance of this precipitate their amount may be roughly ascertained. But by this test no note is taken of any part of these alkaloids which may exist in the bark in an insoluble form, not in combination with Kinic acid. A fourth test, which also takes no notice of this insoluble part (existing as Cincho-tannate, Kinovate, and Cincho-fulvate of Quinia or Cinchonia), is to precipitate a decoction of 100 gr. in f℥ij. of water with f℥j. of a concentrated solution of Carb. Soda. By this mode, 2 gr. of Quinia should be obtained from good yellow bark.

There are two chief ways in which a more or less exact quantitative estimate may be made of the amount of alkaloids in a specimen of bark.

1. *Precipitation Method.*—Dr Buchner obtains the alkaloids, slightly coloured and impure, by simply exhausting the bark by boiling in dilute Sulph. acid, then concentrating the liquid as much as possible, and precipitating by Ammonia in excess. By this means 2·187 gr. were obtained from 100 gr. of Calisaya. Another way is to commence by extracting all the acids from the bark by the use of Carb. Soda, as in the E. formula for the preparation of Sulph. of Quinia. When Quinia and Cinchonia are obtained mixed, they may be separated by means of Ether, which dissolves away the former.

2. *Chloroform Method.*—This is the invention of M. Rabourdin, and seems to have yielded very accurate results. ʒv. of Yellow or Red bark, or a larger quantity of Grey bark, are exhausted by percolation in a displacement apparatus with dilute Hydrochloric acid (fʒv. in Aq. Oijß). The solution is then shaken up with 90 gr. of Caustic Potash and fʒv. of pure Chloroform. The alkaloids being set free from the acid by the Potash, are dissolved out of the watery solution by the Chloroform, which has a great affinity for them. The Chloroform forms a floating stratum below a red liquid. It must be carefully separated, and the alkaloids obtained by evaporation. Quinia and Cinchonia may then be separated by means of ether, or by solution in a small quantity of boiling alcohol, out of which the Cinchonia will crystallise on cooling.

The B. P. gives a similar process for ascertaining the amount of alkaloid in a small quantity of Cinchona bark. A solution in HCl is treated with KO in excess, and the liquid shaken up with ether (in the case of yellow bark) to dissolve out the Quinia, or with Chloroform (in the case of pale or red bark) to dissolve the mixed alkaloids. "Boil 100 gr. of the bark, reduced to very fine powder, for a quarter of an hour in a fluid ounce of distilled water acidulated with ten minims of Hydrochloric acid, and allow it to macerate for twenty-four hours. Transfer the whole to a small displacement tube, and after the fluid has ceased to percolate add at intervals about an ounce and a half of similarly acidulated water, or until the fluid which passes through is free from colour. Add to the percolated fluid solution of subacetate of lead, until the whole of the colouring matter has been removed, taking care that the fluid remains acid in reaction. Filter and wash with a little distilled water. To the filtrate add about thirty-five grains of caustic potash, or as much as will cause the precipitate which is at first formed to be nearly redissolved, and afterwards six fluid drachms of pure ether (or chloroform). Then shake briskly, and, having removed the ether, repeat the process twice with three fluid drachms of ether, or until a drop of the ether employed leaves on evaporation scarcely any perceptible residue. Lastly, evaporate the mixed ethereal solutions in a capsule. The residue, which consists of nearly pure Quinia, when dry, should weigh not less than 2 grains, and should be readily soluble in dilute Sulphuric acid."

100 gr. of Pale bark, treated with this test (using chloroform), should yield not less than ½ gr. of mixed alkaloids. (B.)

100 gr. of Red bark (using chloroform) should yield not less than 1½ gr. of mixed alkaloids. (B.)

In Christison's Dispensatory is given a table of the amount of the alkaloids in different kinds of bark, according to some early investigators; but not only were the results of these chemists (Soubeiran, Von Santen, &c.) very discrepant, but they probably all underrated the quantity obtainable in most cases. It may therefore be useful to subjoin a table which has been compiled from the recorded experiments of Dr Riegel of Carlsruhe, who has made trial of both of the above methods, finding them yield very similar results, but that of Rabourdin rather the most accurate. It represents the amount obtained from 100 gr. of each kind of Cinchona bark.

Barks.	Quinia.	Cinchonia.	Quinidia.
Best Calisaya	3·8	...	...
Calisaya Josephiana . . .	3·29	...	...
Middling Calisaya . . .	2·5	...	...
Cinchona pubescens . . .	1·7	...	...
Fibrous Carthagena . . .	...	1·04	1·04
Hard Carthagena . . .	1·04	1·35	...
Best Red bark	2·65	1·51	...
Large Red bark	2·50	1·35	...
False Red bark (?) . . .	·52	·73	...
China Regnia rubiginosa (?) .	...	2·87	...
Heavy Huanuco	...	2·4	...
Thick-quilled Huanuco . .	...	1·87	...
Finest Crown Loxa . . .	·52	·42	...
Ordinary Loxa	...	·73	...
Huamalies bark	...	1·46	...
Thick Huamalies . . .	...	·93	...
Jaen China bark . . .	...	·61	...
China Nova Surinamensis . .	...	...	...

Cusco bark contains Aricina (?) 1·15 per cent.

This table accords for the most part with the results of other recent observers. The analyses of Mr Howard, also a most careful chemist, have already been frequently referred to.

PREPARATIONS OF THE CINCHONA BARKS.

Various preparations of the Cinchona barks are employed in medicine, and have this advantage over the pure active principles, that they are cheaper and easier of preparation. In addition to the alkaloids, they contain more or less of the astringent acids of the bark. They therefore add an astringent property to the tonic power of the others. But these advantages are more than counterbalanced by the bulky nature of these preparations, which often renders them irritant to weak stomachs, and by their uncertainty in strength, which depends not only upon the very variable quality of the barks employed, but also upon their active principles being considerably more soluble in some menstrua than in others.

Infusum Cinchonæ Flavæ, B. Infusion of Yellow Cinchona.

Prep.—B. Infuse *Yellow Cinchona Bark* in coarse powder ℥ß in *boiling Dist. water* Oß. for two hours in a covered vessel, and strain.

[Infusum Cinchonæ pallidæ, L. Infusion of Pale Cinchona.

Prep.—L. Same as above, Loxa bark being used.]

Action. Uses.—In these infusions the Kinates of the alkaloids and most of the Cincho-tannin are dissolved by water, but that part of the active principles which is not in combination with Kinic acid being insoluble, such a preparation is necessarily weak. Either of the infusions forms a good light tonic in delicate states of the stomach, and may be taken in doses of f℥j.–f℥iij. every four hours.

Extractum Cinchonæ Flavæ Liquidum, B. Liquid Extract of Yellow Cinchona.

Prep.—B. Take of *Yellow Cinchona Bark*, in coarse powder, ℔j., *Distilled water* a sufficient quantity, *Rectified Spirit* f℥j. Macerate the Cinchona Bark in two pints of Water for twenty-four hours, stirring frequently; then pack in a percolater, and add more Water, until twelve pints have been collected, or the Water ceases to dissolve anything more. Evaporate the liquor at a temperature not exceeding 160° to a pint; then filter through paper, and continue the evaporation to f℥iij., or until the specific gravity of the liquid is 1·200. When cold, add the Spirit gradually, constantly stirring. The Specific Gravity should be about 1·100.

Action. Uses.—This resembles the *Infusum Cinchonæ spissatum* of the L. P. of 1851. It is a substitute for the *Liquor Cinchonæ* long made by druggists. Being preserved by the spirit, it may be kept for a considerable time. A similar preparation may be made from Pale or Red Bark.

Dose.—♏x.–ʒj.

Decoctum Cinchonæ Flavæ, B. Decoction of Yellow Cinchona.

Prep.—B. Boil *Yellow Bark* in coarse powder ℥j¼ in *Dist. Water* Oj. for ten minutes in a covered vessel, and strain when cold. Add *Dist. water* through the filter to make up Oj.

[Decoctum Cinchonæ pallidæ, L. Decoction of Pale Cinchona.

Prep.—L. Similar to the above, Loxa bark being used.

Decoctum Cinchonæ rubræ, L. Decoction of Red Cinchona.

Prep.— Red bark used.]

Action. Uses.—By the continued action of boiling water, much of the active principle is extracted, but it is also deposited on cooling, in consequence of the Cincho-fulvic acid uniting with the alkaloids, and forming compounds insoluble in cold water.* The Infusions and Decoctions would be much improved by being made with Acidulated water, which would retain the alkaloids in solution. The decoctions may be employed for the same purposes, and in the same doses, as the infusions.

TINCTURA CINCHONÆ FLAVÆ, B. Tincture of Yellow Cinchona.

Prep.—B. *Yellow Bark*, in moderately fine powder, ℥iv., *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

[TINCTURA CINCHONÆ PALLIDÆ, L. Tincture of Pale Cinchona.

Prep.—L. Similar to last, Loxa bark being used.]

Action. Uses.—Either of these may be prescribed as a Tonic with the Infusion or Decoction in doses of fʒj.–fʒiij. Proof Spirit being a good solvent of the active principles of the Cinchonas, especially if acting by percolation, an excellent Extract is yielded on distilling off the Spirit.

TINCTURA CINCHONÆ COMPOSITA, B. Compound Tincture of Cinchona.

Prep.—B. Take of *Pale Cinchona Bark*, in moderately fine powder, ℥ij.; *Bitter Orange Peel*, cut small and bruised, ℥j.; *Serpentary*, bruised, ℥ß; *Saffron*, gr. lx.; *Cochineal*, in powder, gr. xxx.; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Action. Uses.—A stimulant Tonic; more agreeable from the presence of the stimulants; sometimes called Huxham's Tincture of Bark. Used as the above in doses of fʒj.–fʒiv.

Professor Donovan has (Pharm. Journ. iv. 125) recommended a Syrup of Cinchona, of which the active ingredients are Kinate of Quinia, with the natural Cincho-tannin of the bark. It seems to be an efficient and pleasant preparation.

Extracts of the three kinds of bark were ordered in the L. P. The watery extracts are convenient for exhibition in pills in doses of gr. v.–ʒß. They are best prepared in vacuo; but in efficiency are inferior to the spirituous extracts in the same doses.

Incompatibles with Cinchona Preparations.—Ammonia, Potash, their Carbonates, Lime water, Arsenite of Potash, Tartar Emetic, Persalts of Iron, Acetates of Lead, Chloride of Mercury, Nitrate of Silver, Tincture or Infusion of Galls, Solutions containing Tannic acid, and Gelatine.

PREPARATIONS OF THE CINCHONA ALKALOIDS.

These alkaloids supply as with the active parts of the Cinchona barks in a pure, elegant, and concentrated state. They have the advantage over those barks of greater power and of uniformity of strength. On these grounds they are generally preferred to the

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* Schlottfeldt has obtained pure Quinia in considerable quantities from the residue of Cinchona bark which had been employed to make the decoction.

barks, though the latter contain in addition to them some astringent principles and a volatile oil.

QUINIÆ SULPHAS, B. Quinæ Disulphas, L. Sulphate or Disulphate of Quinia, commonly called Sulphate of Quinine. Prepared from Yellow Cinchona bark, and from the bark of *Cinchona lancifolia*, Mutis. (B.)

This salt ($C_{40} H_{24} N_2 O_4 + S O_3 + 8$ Aq.) has now almost entirely superseded all the other preparations of Cinchona, and is that commonly spoken of as Quinine. As Quinia exists in bark combined with Kinic acid, it is first detached from this, and then made to unite with Sulphuric′. This is effected by various processes. In these Yellow bark is generally employed, as richest in Quinia, and as containing it less mixed with the other alkalies. Fibrous Carthagena bark, produced by *C. lancifolia*, is also used. The bark is first exhausted of its bitterness by repeated maceration in water acidulated with Sul′ or with H Cl, then some more powerful base is presented to the acid, which precipitates the Quinia. This is finally purified and combined with Sul′.

Prep.—B. Take of *Yellow Cinchona Bark*, in coarse powder, ℔j.; *Hydrochloric acid*, f℥iij.; *Distilled water*, a sufficiency; *Solution of Soda*, Oiv.; *Dilute Sulphuric acid*, a sufficiency. Dilute the Hydrochloric acid with Ox. of the water. Place the Cinchona Bark in a porcelain basin, and add to it as much of the Dilute Sulphuric acid as will render it thoroughly moist. After maceration, with occasional stirring for twenty-four hours, place the bark in a displacement apparatus, and percolate with the diluted Hydrochloric acid, until the solution which drops through is nearly destitute of bitter taste. Into this liquid pour the solution of Soda, agitate well, let the precipitate completely subside, decant the supernatant fluid, collect the precipitate on a filter, and wash it with cold Distilled water, until the washings cease to have colour. Transfer the precipitate to a porcelain dish containing a pint of Distilled water; and applying to this a steam heat, gradually add Dilute Sulphuric acid until very nearly the whole of the precipitate has been dissolved, and a neutral liquid has been obtained. Filter the solution while hot through paper, wash the filter with boiling Distilled water, concentrate till a film forms on the surface of the solution, and set it aside to crystallise. The crystals should be dried on filtering paper without the application of heat.

The acids dissolve out the Quinia in the form of Sulphate and Hydrochlorate, setting free Kinic acid. The Soda combines with the $S O_3$, H Cl, and Kinic acid, forming soluble salts, and precipitating the Quinia. This is washed, dissolved in water and $S O_3$, and the solution evaporated to obtain crystals of the Sulphate. (To obtain it pure and colourless, re-solution may be necessary, and decolorisation with animal charcoal.)

Manufacturers find it cheaper to precipitate the acid liquid with lime. The precipitate, pressed into a cake between folds of calico, is acted on by rectified spirit, which dissolves out the Quinia.

The Edinburgh College dissolved out the acids of Cinchona bark with Carbonate of Soda, and then acted on the residuum with $S O_3$. The D. C. imitated the process of the manufacturers.

The use of spirit in this preparation is said not to add more than one penny an ounce to the cost of production.

[A manufacturing chemist, Mr Herring, has *taken out a patent* for a form of preparation which differs only from that of the E. C. in substituting Caustic Soda or Potash for Carb. Soda.

Dr Herapath has taken out a patent for another process (P. J. xiv. 29), in which Carb. Soda is first used as in the E. P. H Cl is employed to extract the alkaloid, which is then separated by heating the acid solution with milk of Lime, the precipitated Quinia being finally dissolved by means of Fusel Oil or Benzole, which being agitated with the liquid, floats to the surface with the alkaloid in solution.

M. Pelletier (in 1833) proposed to make use of Turpentine to dissolve Quinia out of the dried mixture of this alkaloid and Lime, obtained as above.]

Sulphate of Quinia, or Disulphate of Quinia,* as it is considered by some chemists, is usually seen as a light flocculent mass of white, silky, slightly flexible, needle-shaped crystals, interlaced with each other, and grouped in small star-like tufts. They are without odour, but the taste is intensely bitter. Exposed to the air, the crystals effloresce, losing 6 parts out of their 8 equivalents of water of crystallisation. At 212° they become luminous, especially if rubbed : at 240° they melt, losing 2 more equivalents of water, then become red, and at last ignite and burn away, leaving no residuum. According to Baup, they require 740 parts of cold and about 30 parts of boiling water for solution, giving a bluish tinge to the water. They require only 60 parts of Rectified Spirit at ordinary temperatures, and are very soluble in diluted acids, especially Dil. Sul′.

Sulphate of Quinia, on account of its high price, is apt to be adulterated with the analogous salts of Cinchonia and Quinidia, as also with other bitter alkaloids, or even with crystalline fatty matters, Sulphate of Lime, Sugar and Starch, &c. The following tests of purity are given by the B. P. :—"In filiform silky snow-white crystals, of a pure intensely bitter taste, sparingly soluble in water, yet imparting to it a peculiar bluish tint. The solution gives with Chloride of Barium a white precipitate insoluble in Nitric acid, and when treated first with solution of Chlorine and afterwards with Ammonia, it becomes of a splendid emerald-green colour. It dissolves in pure Sulphuric acid with a feeble yellowish tint, and undergoes no further change of colour when gently warmed. Ten grains, with ten minims of diluted Sulphuric acid and half a fluid ounce of water, form a perfect solution, from which ammonia throws down a white precipitate. This redissolves on agitating the whole with half a fluid ounce of pure ether, without the production of any crystalline matter floating on the lower of the two strata, into which the agitated fluid separates on rest. The upper stratum of fluid, if entirely removed by a pipette and evaporated, leaves a white residue, which, when dried in the air without heat, weighs 8·6 grains."

This salt being one, the exact purity of which, on account of its expense and remedial value, it is of importance to ascertain, it may be useful to arrange the adulterations to which it is liable under 8 heads, stating successively the means for their detection.

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* The formula of Quinia having been doubled, the Disulphate of the L. P. is the Sulphate of the B. P. It was called a basic salt, but is now regarded as a neutral salt.

1. *Sulphate of Cinchonia* is much cheaper than the same salt of Quinia. Though it forms large crystals, it may be made to crystallise in a fine pulverulent form, by stirring a strong solution while cooling. In the process for preparing Quinine, the salt of Cinchonia remains in the mother-liquor on account of its greater solubility. But as it is often found in Yellow bark, it may fairly exist in the commercial salt to the extent of 1½ or 2 per cent. When in larger quantities, Red or Pale bark has probably been employed, or adulteration purposely practised. In this case its presence may be detected by shaking a little of the salt with a large quantity of Lime water, when the Quinia is dissolved, but the Cinchonia left. Or the mixed alkaloids may be separated from the solution by Ammonia, then boiled in a small quantity of alcohol, out of which the Cinchonia alone will crystallise on cooling. A third and more exact process is that of Liebig, which depends upon the fact that Quinia is soluble in ether, but Cinchonia almost insoluble. The solution of the Sulphates is precipitated by excess of Ammonia, and the liquid then shaken up with a considerable quantity of ether. The latter soon separates on the surface of the water, holding the Quinia in solution. Being carefully removed and evaporated, it yields the Quinia. The loss is Cinchonia.

2. *Sulphate of Quinidia* resembles in appearance the same salt of Quinia. In consequence of a late decree of the Bolivian government, which closed the Calisaya forests for a term of years, and thereby increased the price of the genuine Yellow bark, the manufacturers of Quinine were driven to resort to the cheaper barks of Peru and New Granada. Some of these, and more particularly the *fibrous Carthagena bark*, yield Quinidia instead of Quinia (*see* p. 513), whence it follows that this alkaloid has been lately found in large quantities in the commercial sulphate of Quinia. Its presence may be detected in two ways; by the sulphate being more sol. in boiling Aq. than the officinal Quinine; and by the alkaloid Quinidia being less sol. in ether than Quinia. Mr Howard states that 100 grains of Sulph. Quinia are perfectly sol. in 7 oz. of boiling dist. water, but that the same quantity will take up 800 gr. of Sulph. Quinidia. Whence the following is a good rough test. Boil 100 gr. of Quinine (ascertained to be free from sugar, &c.) with 5 oz. of dist. water, and if it is wholly dissolved, it probably contains Quinidia. The solubility of the alkaloids in ether may thus be compared:—10 gr. of pure Quinine, added first to 20 drops of Liq. Ammoniæ (which sets free the alkaloid), are then completely dissolved by 60 drops of ether. Only 1 gr. of Sulph. Quinidia is sol. in the same quantity of ammonia and ether. This degree of solubility will form a second test of purity. When it is desirable to ascertain the precise quantity of Quinidia present, this may be done in either of two ways. The mixed alkaloids may be separated by Ammonia, then dissolved in alcohol or ether, and this being allowed to evaporate spontaneously, the Quinidia alone will crystallise out in large clear prisms. A shorter method is that proposed by Zimmer; the mixed alkaloids are digested in ether which has already been saturated with Quinidia, and it is said that by this means the Quinia alone is dissolved out.

The other impurities of officinal Quinine are more easily detected than the above.

3. *Sulphate of Lime.*—This will be left as a fixed residue, insoluble in water and alcohol, when a small quantity of the salt is ignited. Seldom found.

4. *Stearic or other fatty acids.*—If such an impurity be present, an oily pellicle will float on the surface of the solution when the salt is dissolved in boiling water. Seldom present.

5. *Soluble organic matters*, as gum, sugar, starch, mannite, sugar of milk. These are dissolved by boiling water. The salt will blacken with strong Sulphuric acid. And when the Quinia has been separated by Ammonia, these impurities will be found by evaporation of the solution.

6. *Salicine*, a bitter crystalline principle obtained from willow and elm barks, has sometimes been present in considerable quantities. The impure salt will turn red on the addition of strong Sulphuric acid. Heated with Sulph. acid and Bichromate of Potash, it will evolve the odour of Meadow-sweet.

7. *Phloridzine*, a similar principle found in the root-barks of the Apple and Cherry, has been detected as an adulteration in some recent instances. If a few drops of Nitric acid are added to a small portion of the Quinine which contains it, it becomes first yellow, then green, and finally dark brown. (P. J. xi. 138.)

8. *Ammoniacal Salts*, as the Hydrochlorate, may be detected by the evolution of Ammonia, when the solution is heated with Potash.

(*Sulph. Soda* has been discovered in a sample of Quinine made in Germany; but we are not aware that it has ever occurred as an adulteration in England.)

Tinctura Quiniæ Composita, B. Compound Tincture of Quinia.

Prep.—Dissolve *Sulph. Quinia* gr. clx. in *Tincture of Orange Peel* Oj., with the aid of a gentle heat. Keep for three days in a closed vessel, shaking occasionally; afterwards filter, and strain.

This was introduced in the last P. L., and has proved valuable as an elegant tonic and aromatic combination. It has been affirmed by many that the Quinine is not soluble to the extent ordered, and that it must be precipitated by the Tannic acid which certainly exists in the tincture. But Mr Hemingway has found that, even without using heat, the whole is dissolved with the exception of a very trifling precipitate. It seems that this solvent power is partly owing to a slight acidity of the Tinct. Aurantii, supposed to depend either upon a natural vegetable acid in the peel, or to its having been wet with the orange-juice before drying. (P. J. xi. 68.)

Dose.—fʒj.–fʒiij. Each fʒj. contains 1 gr. of Quinine.

Pilula Quiniæ, B. Pill of Quinia.

Prep.—Take of *Sulphate of Quinia*, gr. lx.; *Confection of Hips*, xx. Mix them to a uniform mass.

3 grs. in 4 of the Pill. Introduced in 1867.

Dose.—Gr. ii.–gr. x.

Vinum Quiniæ, B. Wine of Quinia. Quinine Wine.

Prep.—Take of *Sulphate of Quinia*, grs. xx.; *Citric acid*, grs. xxx.; *Orange Wine*, Oj. Dissolve, first the Citric acid, and then the Sulphate of Quinia, in the Wine; allow the solution to remain for three days in a closed vessel, shaking it occasionally; and afterwards filter.

One grain in the ℥. An elegant mode of administering Quinine. Long sold by druggists, but now for the first time introduced in the Pharmacopœia. Quinine will dissolve in most kinds of Sherry, without any necessity of using Citric acid.

Dose.—f℥ß–f℥j.

Quiniæ Bisulphas.—As the officinal sulphate is generally prescribed along with a small quantity of Dil. Sulph. acid (♏j. to gr. j.) to render it sufficiently soluble in water, the Bisulphate is, in fact, the compound which is commonly given. This salt is soluble in 10 parts of water at 60°. By evaporating its solution rhombic crystals are obtained.

Quiniæ Hydrochloras.—The Hydroch. of Quinia is formed by mixing a hot solution of Sulph. Quinia ℥j. with a solution of gr. cxxiii. of Chloride of Barium. Sulph. Baryta falls, and is separated by filtration. The Hydrochlor. of Quinia crystallises when the solution is evaporated. In properties and uses it resembles Sulph. Quinia, but it is much more soluble in water.

QUINIÆ HYDRIODAS.—This preparation is often incorrectly termed Iodide of Quinine. The neutral Hydriodate may be obtained in yellow prismatic crystals, by decomposing with Iodide of Potassium a solution of Sul. Quinia in dilute SO_3, then washing to free from Sulph. Potash. Mr Spencer recommends to dissolve pure Quinia in a warm solution of Hydriodic acid; the crystals separate on cooling, and none of the salt is lost by the washing. This Hydriodate dissolves in about 20 parts of water at 60°; it is an elegant preparation, deserving of a more extensive trial in cases of debility connected with a scrofulous diathesis.

VALERIANATE OF QUINIA was officinal in the D. P. It has been much extolled as an Antispasmodic tonic in convulsive diseases, being thought to combine the properties of its component parts. It has also been used as an Antiperiodic.

Dose.—Gr. j.–gr. iij.

QUINIÆ ARSENIS.—Arsenite of Quinia has been lately much employed, especially abroad, as a remedy for cutaneous diseases. It may be made by a double decomposition between Sulph. Quinia and Arsenite of Potash, but M. Soubeiran recommends the following formula as much better:—

Prep.—Dissolve *Sulph. Quinia*, 100 parts, in *Aq. dest.* acidulated with *Sulph. acid.* Precipitate the Quinia with Ammonia, wash it, press in bibulous paper, and dissolve it in *Rect. Spirit*, 600 parts. Add *Arsenious acid*, 14·4 parts, heat them together, and filter. As the liquid cools, the Arsenite of Quinia separates in acicular crystals.

FERRI ET QUINIÆ CITRAS, B. Citrate of Iron and Quinia.

This elegant double salt has long been in use as a tonic and chalybeate medicine. A formula for its production was first given in the B. P. 1864. Mr Redwood has given directions to make it by dissolving iron filings in solution of Citric acid by the aid of heat, adding recently-precipitated Quinia, and evaporating. Prepared in this way, or by the B. (1864) process, it would contain a Citrate of Quinia with Citrates of the Protoxide and Peroxide of iron. Made by the improved process of 1867, it contains only the Peroxide. It is a double salt, analogous to the Ammonio-citrate of iron, and, like it, is prepared in scales.

Prep.—B. Take of *Solution of Persulphate of Iron*, f℥ivß; *Sulphate of Quinia*, ℥j.; *Diluted Sulphuric acid*, fʒxij.; *Citric acid*, ℥iij.; *Solution of Ammonia*, *Distilled water*, of each a sufficiency. Mix f℥viij. of the solution of Ammonia with Oij. of Distilled water, and to this add the solution of Persulphate of Iron previously diluted with Oij. of Distilled water, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with Distilled water until that which passes through the filter ceases to give a precipitate with Chloride of Barium.

Mix the Sulphate of Quinia with ℥viij. of Distilled water, add the Diluted Sulphuric acid, and when the salt is dissolved precipitate the Quinia with a slight excess of solution of Ammonia. Collect the precipitate on a filter, and wash it with Ojß of Distilled water.

Dissolve the Citric acid in ℥v. of Distilled water, and, having applied the heat of a water bath, add the Oxide of Iron previously well drained; stir them together, and when the Oxide has dissolved, add the precipitated Quinia, continuing the agitation until this also has dissolved. Let the solution cool, then add in small quantities at a time fʒxij. of solution of Ammonia diluted with f℥ij. of Distilled water, stirring the solution briskly, and allowing the Quinia which separates with each addition of Ammonia to dissolve before the next addition is made. Filter the solution, evaporate it to the consistence of a thin syrup, then dry it in thin layers on flat porcelain or glass plates at a temperature of 100°. Remove the dry salt in flakes, and keep it in a stoppered bottle.

The solution of the Persulphate of Iron being precipitated with Ammonia, the Peroxide is obtained, which, dissolved in Cit. acid, forms Percitrate of Iron. Citric acid is used in excess, so that when the precipitated Quinia is added, it is dissolved, to make the compound citrate. (It is not clear whether the citrates are mixed, or chemically combined.) The salt is finally scaled like the other Citrates of Iron (q. v.)

The salt varies somewhat in character according to the mode of its preparation. The B. P. gives the following description of the result of the process, which applies closely to the salt which has long been sold in the shops. "Thin scales of a greenish golden-yellow colour, somewhat deliquescent, and entirely soluble in cold water. The solution is very slightly acid, and is precipitated reddish-brown by solution of soda, white by solution of ammonia, blue by the ferrocyanide and by the ferridcyanide of potassium, and greyish-black by tannic acid. Taste bitter as well as chalybeate. When burned with exposure to air, it leaves a residue ($Fe_2\,O_3$) which yields nothing to water. Fifty grains dissolved in a fluid ounce of water and treated with a slight excess of ammonia give a white precipitate (Quinia), which, when collected on a filter and dried, weighs eight grains. The precipitate is entirely soluble in pure ether; when burned, leaves but a minute residue.

Dose.—Gr. ij.–gr. v.

CINCHONIÆ SULPHAS.—The Sulphate of Cinchonia is prepared in the same way from Pale Bark as the Sulph. Quinia from Yellow Bark. It resembles the latter in composition. Red Bark contains the two alkaloids in about equal proportions, and will therefore yield both of these salts. The salt of Cinchonia is much more soluble than that of Quinia, being dissolved by 54 parts of cold water and 6 of alcohol. It crystallises in short oblique prisms. It is considered by Pereira and others to be equal in medicinal activity to the Sulph. Quinia. It may be given in the same doses to produce the same effects, and will form a valuable substitute in the case of a failure of Yellow Bark. There is, however, a strong prejudice among medical men in favour of the Quinia salts.

CINCHONIÆ HYDROCHLORAS.—This much resembles ordinary Quinine in appearance, but being easily prepared by acting with H Cl on the cheaper kinds of Red and Pale bark, it is made at about one-fourth the price. It seems to be a most efficient Tonic and Antiperiodic.

QUINIDIÆ SULPHAS.—The Sulphate of Quinidia has been already mentioned as a frequent ingredient in commercial Quinine, and it remarkably resembles the officinal salt in appearance as well as in composition. According to the experiments of Bauduin, this salt also is similar in medicinal quality and exactly equal in efficiency to the Sulph. Quinia. It may, therefore, be given as a substitute for the other in the same doses. But, however similar as medicines this and the preceding salts may be to the Sulph. Quinia, they are certainly cheaper in the market, and they cannot therefore be mixed with it, or substituted for it by the makers, without dishonesty.

Action and Uses of the Cinchona Barks and Quinia—The Cinchona barks are slightly astringent, eminently Tonic and Antiperiodic; hence they are frequently prescribed to strengthen, in diseases of debility or in convalescence from acute diseases, but especially in order to arrest the accession of Intermittent and Remittent Fevers, and attacks of Periodic Neuralgia and of Rheumatism; either in the form of Powder, in doses of gr. x.–gr. xxx., in Infusion, Decoction, Extract, or Tincture; sometimes all three are united in one of the watery preparations. But as the properties depend chiefly on the alkalies, though partly also on the astringent principle, the former, especially in the form of the Sulphate of Quinia, have nearly superseded all the other preparations. The similar preparation of Cinchonia may no doubt be, and is, used for many of the same purposes. The Sulphate of Quinia, often converted to a Bisulphate by a few drops of Sul′, is prescribed in doses of gr. v.; but scruple doses have been given in obstinate periodic attacks of Neuralgic pain or of Ague.

CATECHU PALLIDUM, B. Pale Catechu. *Gambir. Terra Japonica.* Uncaria Gambir, *Roxburgh.* Extract of the Leaves and young roots. (From Singapore.)

This is now the only kind of Catechu mentioned in the B. P., the brown Catechu of the Acacia being no longer officinal. Like the other, it is an astringent extract, containing Tannic acid, but rather less than *Catechu nigrum.* It is formed by boiling down the leaves and young shoots of a Cinchonaceous plant of the Malayan Archipelago, which was described as *Nauclea Gambir* by Mr Hunter, in the Linn Trans., vol. ix., and afterwards referred by Roxburgh to the genus *Uncaria.*

Uncaria (*Nauclea*) *Gambir.*—Stem shrubby, twining, with rough brown bark. Branches crowded, round, smooth; branchlets opposite, spreading. Leaves opposite; stalked, ovate, waving, marked below with transverse parallel veins. Stipules 2, caducous. Peduncles axillary, solitary, pointed, forming a hooked spine after the flowers have fallen. Bracts 4, small, ovate, caducous. Fl. aggregate, numerous florets crowded on a globular receptacle. Calyx 1-leafed, oblong, 5-cleft, persistent. Corolla hypocrateriform, 5-cleft. Stamens 5, with very short filaments. Capsule stalked, oblong, crowned with the calyx, tapering to a point below; 2-celled, 2-valved, valves adhering at the apex, splitting at the sides. Seeds numerous, oblong, very small, with a membranous pappus at both ends.

Habitat.—Malacca and Sumatra.

M. Berthold Seeman states that the plant is very extensively cultivated by the Chinese at Singapore, and is grown along with pepper in the same plantations. He states that the leaves are boiled in water until their astringency is all extracted ; that this decoction is then inspissated, and cut into square pieces to dry. The Pale Catechu is thus obtained in small cubical masses, which are now sometimes compressed into bales of 2 cwt. each, which are covered with calico. The cubes are about an inch in diameter, reddish-brown externally, internally ochreous or pale brick-red, friable, porous, breaking with an earthy fracture, floating in water. Entirely soluble in water. Taste first astringent, then sweetish. The decoction, cooled, is not turned blue by Iodine (no starch). Gambir contains about 36–40 per cent. of Tannic acid, according to Nees von Esenbeck, also *Catechine* or Catechuic acid, a modification of Tannin, which turns the salts of iron green. Under the microscope it is seen to consist mainly of myriads of minute crystals.

Fig. 79.

Some kinds of Gambir are imported in small lozenges, others in prisms or cylindrical pieces. It is cultivated on all the islands of the Archipelago and on the mainland of Malacca. The best is made at Rhio, in the island of Bintang, on which, according to Bennett, there are 60,000 plantations.

Pale Catechu may be used as an astringent externally or internally. It has to some extent taken the place of brown Catechu in the drug-market, but the latter contains more Tannic acid, and is much preferred by tanners. (See *Acacia Catechu.*)

PULVIS CATECHU COMPOSITUS, B. Comp. Catechu Powder.

Prep.—B. Take of *Pale Catechu* ℥iv., *Kino* ℥ij., *Rhatany* ℥ij., *Cinnamon* ℥j. *Nutmeg*, ℥j. Reduce them separately to a fine powder; mix them thoroughly, and pass the powder through a fine sieve. Keep it in a stoppered bottle.

Action. Uses.—Aromatic Astringent; may be given in ʒß doses.

INFUSUM CATECHU, B. Infusion of Catechu.

Prep.—B. Infuse *Pale Catechu*, in coarse powder, gr. clx.; *Cinnamon*, bruised, gr. xxx.; *Boiling Distilled water*, f℥x., in a covered vessel, for half an hour, and strain.

Action. Uses.—Powerful astringent, in doses of f℥jß, 3 or 4 times a-day.

TINCTURA CATECHU, B. Tincture of Catechu.

Prep.—B. *Pale Catechu*, in coarse powder, ℥ijß; *Cinnamon*, bruised, ℥j.; *Proof Spirit*, Oj. Seven days. Make up Oj.

Action. Uses.—As Proof Spirit dissolves both the astringent and resinoid principles, this Tincture is strongly astringent, and useful as an adjunct to Chalk Mixture, &c., in doses of fʒj.–fʒij.

TROCHISCI CATECHU, B. Catechu Lozenges.

Prep.—Take of *Pale Catechu*, in powder, gr. 720; *Refined Sugar*, in powder, ℥xxv.; *Gum Arabic*, in powder, ℥j.; *Mucilage of Acacia*, ℥ij.; *Distilled water*, a sufficiency. Add to the Catechu the Sugar and Gum Arabic, previously mixed, the mucilage, and sufficient Distilled water to make a proper mass. Mix thoroughly, divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Action. Uses.—Each lozenge contains 1 gr. of Catechu. The pale kind is used, as more easily soluble in the mouth. Six or twelve of these lozenges will equal an ordinary dose of the powder. They may be used for diarrhœa, pyrosis, or indigestion.

VALERIANEÆ, Dec. Valerianads.

The perennial plants of this order secrete a volatile oil of a strong odour, and possessed of stimulant properties. They inhabit temperate climates.

VALERIANÆ RADIX, B. Valeriana officinalis, Linn. The root of Wild (or cultivated) Valerian. *Triandria Monogynia*, Linn.

Some of the Valerians have been used in medicine from the earliest times. Dioscorides describes three kinds of Nard or Valerian besides the φου. The Spikenard of the ancients, *Nardostachys Jotamansi* (Him. Bot. t. 45), a product of the Himalayas, is still highly esteemed in the East. *Valeriana celtica* and *Saliunca* are even imported by the Red Sea from Austria for perfuming their baths. (*See* Illustr. Himal. Bot. p. 242.) *V. Dioscoridis* is supposed to be the φου of that author, and the officinal or wild Valerian was no doubt early introduced as a substitute for it.

Root perennial, tuberous. Stems 2 to 4 feet high, smooth, furrowed. Leaves all pinnate, or pinnately cut; leaflets lanceolate dentate, in 7 to 10 pairs, terminal one very little, if at all, larger than the others. Infloresence a corymb, becoming at length somewhat panicled. Bracts ovate-lanceolate. Calyx-limb involute during flowering, then unrolled into a deciduous pappus, consisting of many plumose setæ. Corolla roseate; tube funnel-shaped, gibbous at the base; limb 5-lobed. Stamens 3. Fruit smooth, compressed, 1-celled, 1-seeded, crowned by the limb of the calyx expanded into a feathery pappus.—Ditches and damp places throughout Europe.—E. B. 698. Esenb. and Eberm. t. 254.

The tuberous root-stock with its numerous radicles is the officinal part; that which grows in dry pastures is more fragrant, and that of the wild more so than that of the cultivated plant. It should be "collected in autumn, and dried, the root of wild plants growing on dry soil being preferred." (B.) It has a bitter acrid taste, and a powerful penetrating odour, which is considered disagreeable by most people. It consists of Volatile Oil about 1 per cent., Resin 6, Resinous Extractive 12·5, Extractive 9·4, and of Woody Fibre 71 per cent. (*Trommsdorff.*) The Oil, upon which the properties of Valerian depend, is of a greenish colour, has a strong penetrating odour, and a camphoraceous, aromatic taste. When fresh, it contains an oily principle, *Valerole*, which is crystallisable, and some passes into Valerianic acid by being oxygenated in the air. It also contains a Hydro-Carbon, *Bornéene* (C_{10} H_8), identical with the oil obtained from Borneo Camphor; and finally, a Camphor which is identical with the Borneo Camphor. (*Gerhardt.*) When the root is distilled with water, there comes over with the Oil an acid fatty matter (*Valerianic acid*). This is an oily fluid, with a disagreeable smell; Sp. Gr. 0·944, boiling at 270°. It forms soluble salts of a sweet taste with bases. This acid may be produced by the oxidation of the Hydrated Oxide of Amyle, or Oil of Potato Spirit (*see* p. 119). It is used to make the Valerianates of Soda and Zinc. The Messrs Smith, of Edinburgh, have published a good formula for preparing it from the root. They boil this with a solution of Carb. Soda, which extracts the acid; then adding Sulph. acid to the liquid, they distil off the free Valerianic acid.

The active properties of Valerian Root may be extracted by alkalised water, Spirit, or Ammoniated Spirit.

Action. Uses.—Diffusible Stimulant and Antispasmodic. The Volatile Oil is recommended by many. The Valerianates of Zinc, Iron, and Quinia have been employed of late as Antispasmodic Tonics.

Dose.—Of the powdered root, gr. xx.–gr. xl. Of the Volatile Oil, ♏iij.–♏v.

INFUSUM VALERIANÆ, B. Infusion of Valerian.

Prep.—L. Infuse for an hour *Valerian*, bruised, gr. cxx. in *boiling Dist. water* Oß, in a covered vessel, and strain.

Action. Uses.—Moderate stimulant, in doses of f℥j.–f℥ij.

TINCTURA VALERIANÆ, B. Tincture of Valerian.

Prep.—B. Take *Valerian root* in coarse powder ℥ijß, *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Stimulant adjunct to draughts in doses of f℥ß to f℥iv.

TINCTURA VALERIANÆ AMMONIATA, B. Ammoniated Tincture of Valerian. Tinct. Val. Comp. L.

Prep.—B. Take *Valerian root* in coarse powder ℥ijß, *Aromatic Spirit of Ammonia* Oj. Macerate for seven days in a well-closed vessel, then filter, and add *Arom. Spir. Ammon.* q. s. to make Oj.

Action. Uses.—Antispasmodic, and more Stimulant from the presence of Ammonia; may be given in doses of f℥ß–f℥ij.

COMPOSITÆ, *Adans.*

Synanthereæ, *Auct.* Asteraceæ, *Lindley.* Composites.

Sub-ord. I. CYNAROCEPHALÆ.

Florets hermaphrodite, all tubular, with 5, or rarely 4, equal teeth, with a convex or hemispherical top. Stigma jointed to the style.—Several of these are bitter, as *Centaurea Centaurium;* a few are a little odorous, as *Centaurea moschata.* The Safflower, *Carthamus tinctorius,* is valued on account of the colouring matter procurable from its florets.

The leaves of the *Cnicus benedictus,* or Blessed Thistle, a native of the south of Europe, and of Asia, and the root and seeds of the *Arctium minus,* or Lesser Burdock, a common indigenous plant—both contain bitter principles, were long in popular use as alterative tonics, but are now no longer officinal.

Sub-ord. II. CORYMBIFERÆ.

Florets of the disk all tubular, forming a level top; marginal florets often ligulate. Stigma not joined to the style.

The decoction, infusion, and some other preparations of the leaves and flowers of the common *Tussilago Farfara,* or Coltsfoot, are frequently employed as demulcent in coughs. This plant was the *βήχιον* of the Greeks. It is mucilaginous and slightly bitter.

[INULA, L. Inula Helenium, *Linn.* Radix. Root of Elecampane.

Elecampane has been prescribed since the time of Hippocrates.

Root perennial, thick, elongated, brownish externally, white in the inside. Stem erect, 3–4 feet high, round, leafy. Leaves large, cordate-ovate, acute, stem-clasping, unequally toothed, downy beneath; radicle leaves petioled, ovate-oblong. Flower-heads few together, or solitary, large, bright yellow. Involucre imbricated in many rows, outer scales ovate, inner obovate. Florets of the ray female, ligulate, 3-toothed, subtubular; those of the disk hermaphrodite, tubular, 5-toothed. Anthers with two bristles at the base. Receptacle flat, reticulated. Achænia quadrangular, smooth. Pappus uniform, in one row, composed of roughish setæ. Moist pastures throughout Europe, flowers in July and August.—St. and Ch. 49.

The root, when chewed, tastes first glutinous, then bitter and aromatic, and finally a little pungent. It is generally cut into slices for the convenience of drying and preserving. It contains Bitter Extractive 36·7, a peculiar kind of starch, which has been named *Inuline* 36·7, *Helenine,* or a neutral crystalline principle in some respects resembling Camphor, 0·3, Wax 0·6, acrid Resin 1·7, Gum 4·5, with Lignine, Albumen, and Salts of Potash, Lime, and Magnesia. *Inuline*, which has been found in many other roots, and has received different names, is a white amylaceous substance, something like common Starch, but differing in a part being precipitated on cooling from its boiling watery solution, in being rendered of a yellow colour by Iodine, and in being a little soluble in boiling Alcohol.

Action. Uses.—Stimulant, Tonic, Expectorant, and Diaphoretic; has been prescribed in Dyspepsia and in Chronic Catarrh.

Dose.—Powder, gr. xx.–ʒj. Of the Decoc. or Inf. (℥ß to Aq. Oj.) f℥jß.

Pharm. Prep.—Conf. Piperis nigri, L. A constituent of many preparations on the Continent. Omitted in the B. P.]

In the article Senna (p. 407) it was mentioned that a very good substitute for Senna is afforded by one of the Compositæ. This is BERTHELOTIA LANCEOLATA var. *indica*, Dec. (Prod. v. p. 376), of which the leaves, as ascertained by Dr Falconer, are those called *ra* and *rae-Suna* by the natives of North-west India. They are mentioned in Dr Royle's Illustr. of Himal. Bot. p. 319, having been given to him as those of *Salvadora indica*, Royle, which they a good deal resemble, and are produced in the same arid tract of country extending from the banks of the Jumna towards central India. Dr F. pronounces the leaves to be an excellent substitute for Senna, and to be remarkable for growing with their edges vertical, and for having both sides covered with stomata.

ANTHEMIDIS FLORES, B. Anthemis nobilis, *Linn.* Flower-heads, single or double, dried. Chamomile or Camomile.

The name ἀνθέμις occurs first in Theophrastus, and that of αμαίμηλον in Dioscorides. *Anthemis Chia* is supposed to be the plant of Dioscorides. Others have been substituted, as *Matricaria suaveolens* in India; *M. Chamomilla* was at one time distinguished as Common Chamomile, and the other called Noble or Roman Chamomile. The last is the present *Anthemis nobilis*.

Roots perennial, with long fibres. Stems in a wild state procumbent, when cultivated, erect, about a foot long, much-branched, leafy, round, furrowed, hollow. Leaves doubly pinnate; leaflets linear, subulate, slightly hollow. Flower-heads terminal, solitary, with a convex yellow disk. Rays composed of hermaphrodite, tubular, 5-toothed florets. Rays white, reflexed, or spreading, formed of female florets in one row. Receptacle conical (fig. 2) with membranous scales. Involucre imbricated in a few rows, scales obtuse, hyaline at the margin. Fruit obtusely tetragonal, smooth, crowned with an obsolete margin, without pappus.

Two varieties are known. *a.* Flore simplici, fig. 80. *b.* Flore pleno, double Chamomile, in which the florets of the disk are converted into white ligulate florets. (*See* fig. 80, 1.) Indigenous in gravelly places, also in other parts of Europe. Flowers in July and August. Cultivated at Mitcham in Surrey.—E. B. 980; St. and Ch. iii. 38.*

The whole plant has a strong but pleasant odour, the taste being bitter with a little aroma. These properties are most conspicuous in the florets of the disk, which yield most Volatile Oil, and therefore the simple flowers are preferable to the double. The double flowers,

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* Besides the above two kinds, a peculiar variety of Double Chamomile, which yields a blue oil, is cultivated at Mitcham. (P. J.)

however, on account of their showiness, are generally preferred by druggists. The active principles depend on the presence of a Volatile Oil, Bitter Extractive, and a little Tannin. Both water and Alcohol take up their active properties.

Action. Uses.—Stimulant, Tonic, and Febrifuge.

Fig. 80.

Infusum Anthemidis, B. Infusion of Chamomile.

Prep.—B. Infuse in a covered vessel for 15 minutes *Chamomile* ℥ß in boiling *Aq. dest.* Oß. Strain.

Action. Uses.—Tonic.

Dose.—f℥jß. The hot infusion is sometimes employed to assist the action of emetics.

Extractum Anthemidis, B. Extract of Chamomile.

Prep.—Boil *Chamomile Flowers* ℔j. with *Dist. water*, Cj. until the volume is reduced to one-half. Strain, press, and filter. Evaporate the liquor by a water bath to a proper consistence, adding, at the end of the process, *Oil of Chamomile* ♏xv.

Action. Uses.—Bitter, Tonic, and Aromatic; the stimulant Oil, being dissipated during the evaporation, is added at the end. Given in doses of gr. x.–gr. xx.

Oleum Anthemidis, B. (*Anglicum.*) Oil of Chamomile.

By distilling the Flowers with water a Volatile Oil is obtained, which is of a yellowish-brown colour, of a strong odour, and pungent taste. It is found chiefly in the disk. (The B. P. states that it is pale-blue, or greenish-blue, gradually becoming yellow.)

According to Brande, the single flowers yield on the average 2℔ 12oz. of the Oil for every 100℔. This Oil has been found by Gerhardt to consist of two parts—one a *liquid hydrocarbon*, the other a ternary oxidised compound, which strongly resembles, or is identical with, *Valerianic acid.*

Action. Uses.—Tonic, Stimulant, and Antispasmodic. May be added to the Extract or to Pills in doses of ♏j.–♏v.

Pyrethri Radix, B. Anacyclus Pyrethrum, *Dec.* The Root. Pellitory of Spain.

This root was known to Dioscorides (πυρέθρον), and is still employed in Eastern medicine under the name of *akurkurha.* The plant is a native of the north of Africa, whence it has been introduced into the south of Europe. Hayne believes that the root is yielded by a nearly allied species, which he calls *A. officinarum*, ix. t. 46, and which he found cultivated in Thuringia.

Anacyclus Pyrethrum has a long fusiform root. Stems numerous, procumbent, branched, pubescent. Radical leaves spreading, petiolated, rather smooth, pinnatifid; the segments pinnated, with linear tubulate lobes; stem leaves sessile. Branches one-headed. Heads many-flowered. Involucre in few rows, short, somewhat cup-shaped, scales lanceolate, pointed, brown at the edges. Receptacle convex, with oblong, obovate, obtuse paleæ. Florets of the ray female, sterile, white above and purplish beneath; of the disk, yellow, tabular, with 5 callous teeth. All the corols with an obcompressed, 2-winged tube, without appendages. Style of the disk with exappendiculate branches. Achænium flat, obcompressed, bordered with broad entire wings. Pappus short, irregular, toothletted, somewhat continuous with the wings on the inner side. *Dec.*—Desf. Fl. Atl. ii. 287; Nees and Eberm. 244; St. and Ch. iii. 97.

The root, as described by Desfontaines, in its fresh state is fusiform and fleshy, about the thickness of the finger, brownish-coloured externally and white within. When handled in this state it produces first a sensation of cold, soon followed by heat. It is without odour, but has an acrid pungent taste, and causes a copious flow of saliva. It is imported from the Levant. The French obtain it from Africa. It is cultivated also in Thuringia and at Magdeburg. The active part is soluble in Alcohol and Ether. It consists of three principles: an acrid fixed Resin, *Pyrethrine*, which is insoluble in Caustic Potash, another *Resin*, which is dissolved by that alkali, and a yellow *Acrid Oil*, also soluble in Potash. (Koene.) The root also contains Inuline, Gum, a little Tannin, Colouring matter, various Salts, and Ligneous fibre.

Action. Uses.—Irritant, Sialagogue. Sometimes used to relieve Toothache, or as a Masticatory in Palsy of the Tongue and relaxation of the Uvula. Omitted in B. P. 1864, restored in 1867.

Tinctura Pyrethri, B. Tincture of Pellitory.

Prep.—Take of *Pellitory Root*, in coarse powder, ℥iv.; *Rectified Spirit*, Oj. Prepare as Tinct. Aconiti. A few drops, applied in cotton wool, may be used to relieve toothache.

ARTEMISIA, *Linn.*

Heads discoidal, homogamous, or heterogamous. Florets of the ray in one row, usually female and toothed, with a long bifid protruding style; of the disk 5-toothed, bisexual, or by the abortion of the ovary, sterile or male. Involucral scales imbricated, dry, scarious at the edge. Receptacle without paleæ, flattish or convex, naked or fringed with hairs. Achænia obovate, bald, with a minute epigynous disk. *Dec.*

The species of Artemisia, extending from European to tropical countries, are most of them remarkable for their strong odour and bitter taste, and have been employed in medicine from the earliest times, as *A. Abrotanum* or Southernwood, *A. vulgaris* or Mugwort, &c. *A. Dracunculus* or *Tarragon* is employed as a condiment in Europe.

Dr Lindley states that the MOXA of China is prepared from the woolly leaves of *A. Moxa*, Dec. The inflammable cones or cylinders called Moxas are prepared in Europe from pith, cotton, &c.; these are now seldom employed, though they were at one time preferred to the actual Cautery, from acting more slowly as powerful counter-irritants, in some painful and spasmodic diseases, as well as in affections of the joints and viscera. In the Himalayas the tomentum of *Chaptalia gossypina* is used as amadou, and is applicable to the same purposes. (Himal. Bot. p. 247.)

SANTONICA, B. Unexpanded flower-heads of an undetermined species of *Artemisia*, Linn. Santonica. (Imported from Russia.)

The substance called by the various names, *Semen sanctum*, *Semen contra*, *Artemisia Santonica*, *Worm-seed*, &c., has long been in use as a vermifuge. It is exported from Russia; it has been obtained from Barbary and Aleppo, from Egypt and the Levant. It consists of the broken peduncles, involucres, half-blown flowers, and tops of several little-known species of *Artemisia*. The Flower-heads which constitute Santonica are rather more than a line in length and nearly half a line in breadth, fusiform, blunt at each end, pale greenish-brown, smooth; resembling seeds in appearance, but consisting of imbricated involucral scales with a green midrib, enclosing four or five tubular flowers; odour strong, taste bitter, camphoraceous. They are neither round nor hairy; that is, they are not intermixed with the flower of the native *Artemisia vulgaris* (Mugwort), or *A. Absinthium* (Wormwood). The properties depend upon a Volatile Oil, and a peculiar principle called *Santonine.*

SANTONINUM, B. Santonin. A crystalline neutral principle obtained from Santonica.

This neutral crystalline principle is obtained from Santonica. It is less bitter than Absinthin, the principle of Wormwood, which also is useful as an Anthelmintic. Santonin has the composition $C_{30} H_{18} O_6$.

Prep.—B. *Santonica* is boiled with water and lime, and the solution precipitated with Hydrochlor. acid. The precipitate is washed with water to free it from acid, and with a small quantity of Sol. Ammonia to separate resin and colouring matter. It is finally decolorised by digestion with Rect. Spirit and Animal Charcoal, and obtained in crystals by the evaporation of the Spirit.

It is colourless, in flat rhombic prisms, feebly bitter, fusible, and sublimed by a moderate heat. It is insoluble in mineral acids, almost so in cold water, sparingly sol. in boiling water, but soluble in solutions of Alkalies and Lime, in rectified Spirit and Chloroform. Exposure to light for some time turns it yellow.

Action. Uses.—A vermifuge, especially recommended for the round worm (*Ascaris lumbricoides*) in children or adults.

Dose.—For a child, gr. j.–gr. iij. of Santonin; for an adult, gr. v.–gr. x. Of Santonica, gr. lx.–gr. cxx.

[ABSINTHIUM, L. Artemisia Absinthium. *Linn.* Herba florens. Wormwood.

The Ἀψίνθιον of the Greeks is corrupted into *Afsunteen* in the East, and other species of Artemisia are substituted for the present plant.

Root ligneous, branched. Stems numerous, bushy, furrowed, leafy, the whole plant covered with close silky hairiness. Leaves alternate, silky (tripinnatisect, *Dec.*), in many deep, lanceolate, obtuse segments; lower ones on long, the upper on short and broad footstalks. Floral leaves simple. Flower-heads in leafy, clustered panicles, drooping, hemispherical, heterogamous; the outer scales of the involucre linear, silky; inner roundish, scarious. Florets of a pale yellow, the outer row female. Styles deeply cloven. Receptacle convex, covered with silky hairs.—Waste ground in various parts of Europe and the north of Asia.—Eng. Bot. t. 1230; St. and Ch. ii. 58. Should be collected in July and August, when in flower.

The dried herb or the flowering top has a greyish silky look; is remarkable for its disagreeable though somewhat aromatic odour; and for its intense bitterness, whence its name has passed into a proverb. Its properties are imparted to water, spirit, and wines. Analysed by Braconnot, it yielded, in 100 parts, Volatile Oil of a dark-green colour, upon which the odour depends, 1·5, Bitter Azotised Extract 30, very Bitter Resin 2·5, Green Resin, 5, with Chlorophyll, Albumen, Salts, and among them *Absinthate of Potash*, which, when the plant is burnt, is changed into Carbonate of Potash. This was long called Salt of Wormwood. The Bitter Extract contains a peculiar neutral principle, called *Absinthin*. Dr Luck has obtained this by simply shaking up Ether with a strong Alcoholic solution of the plant. The Ether is distilled off, and Resin separated by treating with a dilute ammoniacal solution. The formula is said to be $C_{16} H_{11} O_5$. It acts with great power, and without producing excitement. The Essential Oil ($C_{20} H_{16} O_2$), as ascertained by M. Lablanc, in its impure state is of a dark-green colour, and begins to boil at 356° F. Its boiling point rises to 401° as it coagulates. It may be distilled off Quicklime, and when thus purified has a fixed boiling point of 401°; is acrid, with a penetrating smell, and Sp. Gr. ·975 at 75° F.

Action. Uses.—Aromatic, Bitter, and Tonic; is added to some *liqueurs;* employed in Dyspepsia. Also Anthelmintic hence its name of Wormwood.]

The common Tansy, *Tanacetum vulgare*, is an indigenous plant with a strong peculiar odour and bitter taste; it has long been used as a tonic and anthelmintic, but is now superseded by more active remedies.

ARNICÆ RADIX, B. Arnica montana, *Linn.* The root, dried. Mountain Arnica. Mountain Tobacco.

Arnica has long been employed in medicine, though there is no proof that it was known to the Greeks, as inferred by Matthioli. Several dissertations have been written upon its medical virtues, from the time of Lamarche, 1719, to the present day.

ARNICA MONTANA. A perennial plant, with hairy stems, about a foot high. Radical leaves obovate, entire, 5-nerved. Cauline leaves in 1 or 2 pairs. Stems with 1–3 heads of flowers. Head many-flowered, heterogamous. Florets yellow, tinged with brown; those of the ray in 1 row, female, ligulate; of the disk hermaphrodite, tubular, 5-toothed. Involucres rough, campanulate, in 2 rows, with linear-lanceolate equal scales and glands. Receptacle fringed, hairy. Tube of the corolla shaggy. Style of the disk with long arms, downy, truncated. Achene cylindrical, hairy. Pappus in 1 row, of close, rigid hairs.—Meadows and mountainous places of middle and southern Europe.

The plant, when fresh and bruised, has rather an agreeable odour, which is apt to excite sneezing; the taste of the leaves and flowers is bitter and pungent, of the root-stock bitter and acrid. Some mountaineers smoke it like Tobacco. Versmann finds that the aqueous infusion of the flowers of Arnica reacts as an acid, has at first a bitter, and afterwards a strong acrid flavour, depending on the presence of Gallic acid. Sol. of Gelatine renders an infusion of Arnica very turbid, and with Chloride of Iron it yields a black colour, which when largely diluted becomes green. On the addition of Magnesia or its Carbonate, an intensely green colour is produced after a few hours.

The flowers of Arnica have been used in medicine. The B. P. chooses the root as more active. It is, strictly speaking, a rhizome, generally met with in cylindrical twisted pieces of 1–4 inches long, ¼ inch thick, marked with the scars of the leaves, and giving off long slender rootlets. Its taste is acrid; it has a slight but peculiar odour.

A peculiar alkaloid, *Arnicina*, was first discovered in Arnica by M. Lebourdais. Mr Bastic has prepared it in the same manner as Lobelina (q. v.), which it very much resembles in its properties.

Action. Uses.—Acrid Stimulant; Irritant of the Digestive Canal; is much esteemed for its power of discussing tumours and the effects of bruises (hence called *Panacea lapsorum* by Fehr.) when applied in the forms of Cataplasm, or of the Tincture.

Dose.—Of the Powder, gr. v.–gr. x.

TINCTURA ARNICÆ, B. Tincture of Arnica.

Prep.—Arnica Root in coarse powder ℥j., *Rect. Spirit* Oj. Prep. as Tinct. Aconiti.

Applied, diluted with water, to bruises and swellings. Some say that rectified spirit alone is equally efficacious. Arnica acts as a local stimulant, like *Bryony Root*, which is a popular remedy for a "black eye."

Sub-ord. III. CICHOREÆ.

Florets all ligulate. Style cylindrical above and pubescent, as well as its long obtuse branches. Stigmatic lines prominent, narrow.—The Cichoreæ abound in milky juice, which is bitter-tasted and sometimes narcotic. By blanching, some become edible as salads.

Cichorium Intybus, or Wild Chicory, which is indigenous in waste places all over Europe, is extensively cultivated on account of its root, which is much used as a substitute for, and as an addition to, Coffee. The medical properties of the plant are considered to be nearly the same as those of Taraxacum. It is used to adulterate Coffee, and is itself often much adulterated. (*See* P. J. iv. 119, Hassall, &c.)

TARAXACI RADIX, B. Taraxacum Dens Leonis, *Dec.* The fresh and dried Roots. Dandelion.

Dandelion being indigenous in Europe, has long been employed in medicine.

Root spindle-shaped, milky-juiced, smooth and dark-brown externally, white within, easily broken. Leaves numerous, radical, runcinate, glabrous, of a bright shining green. Scapes 1 or more, erect, brittle, with a single head of flowers, which expand in the morning, and are of a golden-yellow colour. Involucre double, external scales spreading or reflexed, internal ones in one row, erect, without callous tips. Receptacle naked. Achænium oblong, striated, muricate at the apex, terminating in a long beak. Pappus hairy, in many rows, radiating so as to form a light globe. Fields and waste places throughout Europe, and extending even to the Himalayas.—E. B. t. 539; St. and Ch. 5.

The root of the *Apargia hispida*, or Rough Hawkbit, is said to have been extensively substituted for Dandelion by the collectors. Taraxacum root is crisp, dark-brown, breaks easily, and exudes a milky juice. That of Apargia is wrinkled, pale, tough, and generally much larger in size.[*]

The leaves, when young, are blanched and used as salad in some parts of Europe: their properties necessarily vary at different periods of growth. The roots are "gathered between September and February, from meadows and pastures in Britain." (B.) The sensible properties of the milky juice are said to be greatest just before inflorescence. The juice expressed from the bruised roots was found both by Mr Houlton and Mr Squire to be of a watery nature in March, but towards the end of summer thick and cream-like, and bitter in taste. Mr Squire, moreover, found that in November and December 4℔ of the juice yield 1℔ of Extract; from March to May from 6 to 9℔. In June, July, and August, from 6 to 7℔. are required to yield the same quantity of Extract. Hence it is

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[*] Professor Bentley has found the roots of Ginseng, Gentian, Chicory, and Tormentil mixed up in a sample of "Dandelion Root" offered for sale in London. Those of Dock, Horse-radish, and Hawkbit have been discovered in other specimens. Mr Bentley lays stress on the thickness of the cortical portion of Taraxacum root, its division into several concentric layers, and its turning to a rose-pink colour with Sulph. acid.

evident that it is during November and December that it abounds most in solid ingredients. Mr Bentley, however, recommends its collection in March. Geiger pronounces the juice to be most bitter in midsummer. In the spring and close of autumn it is sweetish, which Mr Squire ascribes to the effects of frost. The juice also contains Gum, Sugar, Inulin, Albumen, Gluten, an Odorous principle, Extractive,—and a peculiar crystallisable Bitter principle (Taraxacin), soluble in Alcohol and water.

The most efficient mode of prescribing it is in the form of the inspissated juice. The root is sometimes roasted, and used as a substitute for ground Coffee, or its dried powder is mixed with the latter.

Action. Uses.—Aperient, Deobstruent, Alterative, Diuretic, in affections of the Liver and Kidney, chronic cutaneous diseases, &c. Taraxacum, like Sarsaparilla, is a medicine, the beneficial action of which is frequently so slight as to be almost inappreciable.

Succus Taraxaci, B. Juice of Taraxacum.

Prep.—As Succus Scoparii.

Being preserved from decomposition, by a fourth part of Rect. Spirit, it forms a convenient preparation, generally preferred to the decoction.

Dose.—ʒj.–℥ß.

(Widnmann and Frickinger found *Mannite* in the expressed juice of Taraxacum. But the Messrs Smith of Edinburgh have proved, what indeed was considered probable by the German observers, that this substance does not exist in the fresh root, but is produced subsequently by a kind of fermentation (called *viscous*) which takes place in the infusion or juice. It is supposed that Grape-sugar ($C_{12}\,H_{12}\,O_{12}$) is transformed into one atom of Mannite ($C_6\,H_7\,O_6$), and one of Lactic acid ($C_6\,H_5\,O_5$), the other atom of Oxygen being abstracted by some decomposing albuminous compound. This Lactic acid has been found in the Extract by Ludwig. (*Archiv. der Pharm.* 136, 13.)

Decoctum Taraxaci, B. Decoction of Taraxacum.

Prep.—B. Boil dried *Dandelion Root*, sliced and bruised ℥j. in *Dist. water* Oj. for ten minutes, and strain. Make up to Oj.

Action. Uses.—The bitter principle being removed by the boiling water, this may be used in some cases requiring alterative treatment in doses of f℥jß–℥iij.

Extractum Taraxaci, B. Extract of Taraxacum.

Prep.—B. Crush fresh root of *Taraxacum* ℔iv., press out the juice, and let it deposit. Heat to 212° for ten minutes, strain, evaporate by water bath at temperature not exceeding 160°.

Action. Uses.—This is employed in doses of gr. x.–ʒß. It should be bitter in taste, and of a brownish colour. The inspissated juice of the roots pressed out and evaporated spontaneously by the action of dry air, or *in vacuo*, is the best form for exhibition. Mr Giles advises, on the contrary, that the root be dried and powdered, and then macerated with cold water. (P. J. xiv. 258.)

LACTUCA, *Linn.*

Heads few-flowered. Involucre cylindrical, imbricated in 2–4 rows, outer row shorter, scales with a membranous margin. Receptacle naked. Achænium plano-compressed, wingless, terminating abruptly in a filiform beak.

[LACTUCA SATIVA, *Linn.*, L. Herba florens. Garden Lettuce.

The common Lettuce (θρίδαξ) has been used in medicine from the time of the Greeks, as it still is in the East. It is cultivated throughout Europe, and in most European colonies, as a salad.

The common Lettuce is an annual, with an erect, smooth stem, which is two feet high, simple below, and branched above. Leaflets rounded or oval, large, erect, narrow at the base, smooth at the keel, half embracing the stem, often much wrinkled. Flowers appearing in August, yellow, smaller than those of *L. virosa.*

The leaves of the Lettuce, when young, contain a pellucid pleasant-tasted juice, containing Mucilage and Sugar; but when the flowering stem begins to appear, the juice becomes milky, bitter in taste, and of a strong odour, something like that of Opium. These characteristics increase until the flowers have blown. If slices of this stem be cut off, or incisions made into its cortical portion, the milky juice exudes, and on drying becomes of a brownish colour, forming one kind of *Lettuce Opium* or *Lactucarium*, to which Dr Coxe of Philadelphia and Dr Duncan, sen., of Edinburgh, first called attention. Dr Francois subjected it to further examination, calling it *Thridace.*

Action. Uses.—The extract is Anodyne, Diaphoretic, and slightly Diuretic, in doses of gr. ij.–gr. vj. Used to allay Cough and Nervous Irritation, to relieve the pains of Rheumatism, &c., and to induce sleep. Omitted in B. P. 1864, but B. P. 1867 contains a form for the extract of *L. virosa.*

EXTRACTUM LACTUCÆ, L. Extract of Lettuce.

Prep.—Bruise the fresh leaves of *Garden Lettuce*, sprinkled with water, in a Wedgewood or stone mortar, and then press out the juice, and evaporate to a proper consistence.

Action. Uses.—Contains less of the active principle than the extract below, though it resembles it in colour, odour, and taste.]

LACTUCA, B. Lactuca virosa, *Linn.* Strong-scented Lettuce. The flowering herb.

This is supposed to be the θρίδαξ ἀγρία of Dioscorides, though *L. Scariola*, Linn., is adduced by Dr Sibthorp as the plant. This has glaucous vertical leaves, but the same properties as the former.

The Wild Lettuce abounds in acrid milky juice, has a tap-shaped root, with round and erect, slender, glaucous stem, 2-4 feet high, a little prickly below, panicled above. Leaves horizontal, with a prickly keel, otherwise nearly smooth, finely toothed; radicle ones obovate, undivided, those of the stem smaller, often lobed, auricled, and semiamplexicaul. Flower-heads numerous, panicled, with numerous small, heart-shaped, pointed bracts. Florets light yellow. Achænia striated, beak white, equalling in length the black fruit.—Dry banks and borders of fields throughout Europe.—E. B. t. 1957. Flowers about August.

This plant, distinguished by its rank smell and the blood-red spots on its stem, is preferred to the former as a source of Lactucarium. Dr Christison states from information communicated to him by Mr Duncan of Edinburgh, that it yields a much larger quantity and a superior quality of Lactucarium, especially before the middle period of inflorescence; and Schutz has found in Germany that a single plant of *L. sativa* yielded only 18 gr., while one of *L. virosa* produced no less than 56 gr. of Lactucarium.

EXTRACTUM LACTUCÆ, B. Extract of Lettuce. *Lactucarium* of the Wild Lettuce. Lettuce Opium.

Prep.—As Extractum Aconiti. This is a soft green extract.

Lactucarium, as usually met with, is of the consistence of a dry extract, and is sold in roundish, rather hard lumps, having a brown colour, an opium smell, and a bitter and slightly acid taste. It is apt to attract moisture. That made near Edinburgh is "in pieces about the size of a field-bean, rough and irregular, wood-brown in colour, with an ash-grey efflorescence, friable, reddish-brown in powder, of the same odour with the former, but more acrid and bitter to the taste." (*c.*) Analysed by Walz, it was found to contain a Volatile Oil, a yellowish-red tasteless Resin, a greenish-yellow acrid Resin, Crystallisable and Uncrystallisable Sugar, Gum, Pectic acid, Albumen, various kinds of Extractive, a concrete Oil or Wax (one part of which, insoluble in Ether, is the same as the Caoutchouc of other analysts), Oxalates, and other salts—with a neutral active principle, which has been named *Lactucine.* This is in acicular crystals, colourless, without odour, very bitter, fusible, soluble in about 70 parts of water, more so in Ether, Alcohol, and diluted acids. Its watery solution is very bitter, neutral, and not precipitable by any reagent. (Walz, Ann. der Pharm. xxxii.)

Action. Uses.—Narcotic; suited to allay pain and induce sleep, in the same cases as Henbane, and where Opium is ineligible, in doses of gr. v.–gr. xx.

Lozenges of Lactucarium, useful in Coughs, may be made like Opium Lozenges.

M. Aubergier prepares a Spirituous Extract of Lactucarium, which contains all the active principles, and may be prescribed in pills, or made into a syrup by adding 1 part to 500 of syrup.

LOBELIACEÆ, *Juss.* Lobeliads.

The Lobeliaceæ are allied to Cichoreæ and to Campanulaceæ. Found in tropical and temperate parts of the world. They secrete a milky juice, often very acrid and narcotic.

LOBELIA, B. Lobelia inflata, *Linn.* The flowering herb, dried. Indian Tobacco. *Pentand. Monog.* Linn. (From North America.)

This plant was first employed by the natives and then by the medical practitioners of the United States, and in this country first in 1829.

Annual or biennial, with fibrous root. Stem erect, angular, the upper part branched and smooth. Leaves irregularly serrate, dentate, hairy; the lower ones oblong, obtuse, with short petioles; those towards the middle ovate-acute, sessile. Flowers in racemes. Calyx smooth, tube ovoid, 5-lobed, segments linear-acuminate. Corol of a light blue, cleft longitudinally from above, bilabiate, the upper lip narrow, the lower broader, 3-cleft. Anthers united into an oblong curved body, the two inferior barbed at the point. Style filiform; stigma curved, enclosed by the anthers. Capsule 2-celled, ovoid, 10-angled, inflated, crowned with the calyx. Seeds numerous, small, of a brown colour.* Common weed in the United States from Canada to Carolina.—Esenb. and Eberm. 206.

Several species of Lobelia grow in South America. The *L. decurrens* is said to be in common use as an Emetic in Peru.

The whole plant when wounded exudes a milky juice, and all parts are possessed of medicinal activity; but, according to Dr Eberle, the root and inflated capsules are the most powerful. The dried herb is of a pale greenish-yellow colour, of a faint disagreeable smell, and a burning acrid taste, especially perceptible in the fauces. It is generally compressed into rectangular cakes by the Shaking Quakers of New Lebanon, in New York. The active properties are extracted by Proof Spirit and by Ether. It has not yet been satisfactorily analysed. But two peculiar substances have been obtained from it. By treating the decoction with Sulph. Copper, and decomposing the precipitate with a current of HS, Mr Proctor, of America, has isolated a peculiar acid. *Lobelic acid* is crystalline, soluble in water, alcohol, and ether. It precipitates Sulph. Copper light green, Persulph. Iron olive-brown, Acetate of Lead or Baryta yellow, and Nitrate Mercury greyish-white. (P. J. x. 456.)

The presence of a peculiar active principle, *Lobelina*, has been indicated by Calhoun, Pereira, and others. This is described by Mr Bastick as a volatile liquid base, soluble in water, alcohol, and ether; decomposed, but not precipitated, by caustic Alkalies. It has a strong alkaline reaction, pungent taste, and faint smell. Being destroyed by an alkali, it cannot be prepared like Conia and Nicotia. Mr Bastick gives the following formula for its prepartion. (P. J. x. 271.)

Macerate ℔ij. of *Lobelia* for 48 hours in *Alcohol* Cj., to which previously has been added f℥iij. of *Sulph. acid.* Drain off and filter the alcoholic solution. Mix

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* These seeds are seen by a magnifying glass to be ovoid, and marked with cross ridges and furrows, like basket-work. Being thus easily distinguished from all other seeds, they were discovered by Mr Curtis in a secret powder vended by a Mr Coffin, from the use of which some fatal cases of poisoning occurred some years ago.

in with agitation powdered *Caustic Lime*, until the fluid has an alkaline re action. Filter, and add Sulph. acid to slight excess. Again filter, and evaporate with a gentle heat until reduced to about one-fourth. Add to the residue a little water, and again evaporate until all trace of spirit has disappeared. Filter to remove resin. Then gradually add an excess of Carb. Potash, filtering if there is any precipitate. Agitate now with successive portions of ether, until it will no longer dissolve out anything more. By carefully separating and evaporating the ether spontaneously, the Lobelina is left tolerably pure. It may be further purified by solution in alcohol, and digestion with Anim. Charcoal, &c.

Action. Uses.—Narcotic, Acrid, Antispasmodic, acting in many respects like Tobacco ; in large doses Emetic and Cathartic. Used to control attacks of Spasmodic Asthma, either by giving it in full doses so as to excite vomiting, or in small doses repeated until sickness comes on.

Dose.—The dose of the Powder as an expectorant, gr. j.–gr. v. ; as an emetic, gr. x.–gr. xx.

TINCTURA LOBELIÆ, B. Tincture of Lobelia.

Prep.—B. *Lobelia* in coarse powder, ℥ijß; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Expectorant in doses of ♏x.–fʒj. Antispasmodic, fʒj.–fʒij. every 2 or 3 hours. Used thus in Asthma. Emetic in doses of fʒiv.

TINCTURA LOBELIÆ ÆTHEREA, B. Ethereal Tincture of Lobelia.

Prep.—B. Macerate *Lobelia* in coarse powder ℥ijß, in *Spirit of Ether* Oj. for seven days in a close vessel, with occasional agitation. Then press and strain, and add Sp. Ether q. s. to make Oj.

Action. Uses.—Similar to Whitelaw's Ethereal Tincture. Used chiefly as an Antispasmodic. Contains *Lobelina.*

Dose.—♏x.–♏xl.

ERICACEÆ, *Endlicher.* Heath-worts.

The Ericaceæ are found in the cold and temperate parts of the northern hemisphere, and in southern Africa. Many are astringent, some also stimulant,—hence employed as substitutes for Tea, as *Gaultheria procumbens* and *Ledum latifolium.* Some have succulent edible fruit. *Rhododendron chrysanthum* is much employed by the Russians as a stimulant diaphoretic in rheumatism. *R. campanulatum* is employed in the Himalayas as snuff.

Tribe *Ericeæ.* Fruit capsular. Anthers 2-celled. Disk hypogynous. Testa close.

UVÆ URSI FOLIA, B. Arctostaphylos Uva Ursi, *Spr.* The dried Leaves. Bearberry. *Decandria Monogynia*, Linn. *Trailing Arbutus.* (Indigenous).

It is uncertain when this plant was first employed medicinally. Quer maintains that the Spaniards first discovered its nephritic properties. The plant is indigenous.

Evergreen procumbent shrub. Leaves coriaceous, obovate, obtuse, quite entire, shining, of a deep green above, lighter colour and covered with a network of veins on the under surface, hence reticulated. Flowers in terminal clusters of 8 or 10, each supported by 3 small bracts. Calyx 5-partite, of a pale red. Corolla rose-coloured, ovate-urceolate, 5-cleft, border revolute. Stamens 10, enclosed, filaments flattened. Anthers compressed, with 2 pores at the apex, and furnished laterally with 2 reflexed arms. Ovary globose, supported by 3 scales. Style short. Stigma obtuse. Berry globose, scarlet, with 5 single-seeded cells.—Stony Alpine heaths of Europe, Asia, and North America.—Esenb. and Eberm. 215; St. and Ch. 91.

The leaves are the officinal parts, and usually collected in autumn. They have sometimes been adulterated with the leaves of *Vaccinium Vitis Idæa*, or Whortleberry; but these are *dotted* on their under surface, and have their margins revolute and somewhat crenate. The Box leaf is devoid of astringency. *Uva ursi* leaves, when dried and powdered, have an odour not unlike that of hay; the taste is bitter and astringent. The active properties are extracted both by water and Spirit. The watery infusion is precipitated by Gelatine, and a bluish-black colour is produced with the Perchloride of Iron.

They contain *Tannin*, about 36 per cent. Kawalier has analysed them, and found besides this, *Gallic acid*, Fat, Wax, Chlorophyll, a little Sugar and Volatile Oil, with a peculiar substance called *Arbutine*. This is probably the active principle, being modified by the astringency of the Tannin. It crystallises in long, thin, colourless prisms, soluble in water, alcohol, and ether. Its formula is $C_{32}H_{24}O_{21}$. It is neutral. As Salicine forms Saligenine, so, under the influence of water and emulsine, Arbutine changes into Grape-

Fig. 81.

sugar and another neutral substance, called *Arctuvine.* (Annal. der Chem. May 1852.)

The leaves of *Uva ursi* are employed in tanning in some parts of Russia.

Action. Uses.—Astringent Tonic and mild Diuretic. Chiefly applicable in chronic cases of an increased secretion of mucus from the bladder, in doses of the powder gr. x.–gr. xxx.

INFUSUM UVÆ URSI, B. Decoction of Bearberry.

Prep.—B. Infuse *Bearberry Leaves* ℥ß. in *Boiling Dist. water* ℥x. for two hours and strain.

Action. Uses.—Tonic, mild Diuretic, in doses of f℥jß.–℥iij.–3 times a-day.

[EXTRACTUM UVÆ URSI, L. Extract of Bearberry.

To be prepared like Extract of Hop.

Action. Uses.—Tonic in doses of grs. v.–grs. x., 2 or 3 times a-day.]

Tribe *Vaccinieœ*, distinguished by their baccate, fleshy, and inferior fruit, with an epigynous disk, contains Cranberries, Bilberries, and Whortleberries.

Tribe *Pyroleœ.*—Fruit capsular, dry. Seeds with a loose testa. Disk none. Anthers opening by pores.

[CHIMAPHILA, L. Chimaphila umbellata, *Nuttall.* The Herb. Winter Green. *Decand. Monog.* Linn.

This plant, called *Pipsissewa*, was first employed medicinally by the native Americans, and then by the European settlers. It was made known to the profession by Mr Mitchell in 1803, and then by Mr Carter and Dr Somerville. (Medico-Chirurg. Trans. vol. v.)

Small evergreen shrub, with creeping root-stock. Leaves coriaceous, with short petioles, cuneate-lanceolate, coarsely serrated, smooth, and shining. Flowers drooping, in small corymbs, with linear awl-shaped bracts. Calyx 5-cleft. Petals 5, white, with a tinge of pink, spreading. Stamens 10, filaments smooth, dilated in the middle. Ovary roundish, obtusely angular, umbilicated. Style short, concealed in the umbilicus of the ovary. Stigma orbicular, 5-lobed. Cells of the capsule dehiscent at the apex, the valves unconnected by tomentum.—A native of mossy turf in the woods in the northern latitudes of America, Europe, and Asia. Flowers in June and July.—Esemb. and Eberm. 93.; St. and Ch. 93.

The fresh leaves, when bruised, exhale a peculiar odour ; the taste is pleasantly bitter and astringent ; that of the stems and roots is said to be pungent. They contain Gum, a little Tannin, Bitter Extractive, Resin, Saline matter, and Lignin. Dr A. T. Thomson indicated the presence of Gallic acid.

Action. Uses.—Acrid and Tonic. The fresh leaves applied to the skin produce rubefaction. The infusion or decoction, taken internally, acts as a Diuretic and Tonic, and has been prescribed in Dropsies accompanied with debility, and in chronic affections of the Urinary organs, also in Scrofulous complaints.

DECOCTUM CHIMAPHILÆ, L. Decoction of Winter Green.

Prep.—L. Boil *Chimaphila* ℥j. in *Aq. dest.* Ojß down to Oj., and strain.

Action. Uses.—Diuretic and Tonic. The Decoction strikes a deep green with ferruginous salts, and may be given in doses of f℥j.–f℥iij., every 3 or 4 hours.]

STYRACEÆ, *Rich.* Styrax Tribe.

Found in the tropical parts of Asia and of America, with one species in the Mediterranean region, and others in Japan. Remarkable for the secretion of Benzoic and Cinnamic acids in Styrax and Benzcin.

STYRAX, *Linn.* *Decand. Monog.*

Calyx rather campanulate, nearly entire, or 5-toothed. Corolla campanulate at the base, deeply 3–7-cleft. Stamens 6–16, seldom 10, exserted; filaments united to the tube of the corol, sometimes adhering at the base into a ring; anthers linear, 2-celled, opening by internal longitudinal slits. Ovary inferior, style simple. Stigma obtuse, somewhat lobed. Drupe dry, splitting imperfectly into 2 or 3 valves, with 1–2–3 stones. Seed solitary, erect, with a large, leafy, thin embryo lying in the midst of fleshy albumen, with an inferior radicle. (*Lindley.*)—*Styrax officinale* and *S. Benzoin* yield officinal products.

STYRAX. Styrax officinale, *Linn.* (Solid Storax.) Liquidambar Orientale, *Miller*, (Liquid Storax), B. A balsam obtained from the bark in Asia Minor.

STYRAX PRÆPARATUS, B. Prepared Storax.

Storax (στύραξ) was well known to the Greeks. Dioscorides compares the tree producing it with the Quince tree. It is called *asteruk* in the East.

Styrax officinale.—A small tree (fig 82), with smooth bark and downy shoots and petioles. Leaves ovate-obtuse, of a green colour and shining above, white and downy on the under-surface, something like those of the Quince tree. Flowers white, in terminal racemes of a few flowers, which resemble those of the Orange. Calyx downy (2), cup-shaped, 5 to 7-toothed. Corolla externally hairy, with 5 to 7 segments. Stamens (2) 10 to 16. Fruit about the size of a cherry, coriaceous, downy, with 1 or 2 nuclei.—A native of Asia Minor and Syria, common in Greece, and cultivated in the south of Europe. This plant does not yield a balsamic exudation in all these situations. Du Hamel, however, states that he has seen it flow from a tree near the Chartreuse of Montriau.—Esemb. and Eberm. 210; Fl. Græc. t. 375; St. and Ch. 47.

This tree is common in Asia Minor, where Professor Forbes was informed Storax was collected from it. Several kinds of Storax are known in commerce and described in books. (*See* Pereira.) But now only two kinds are known in English commerce; the Solid Storax, or *Styrax Calamita;* and the Liquid Storax, officinal in the B. P. Both are imported from Trieste. The first is a very impure product, consisting of a balsamic Resin, mixed up with sawdust, Benzoin, and sometimes Turpentine, into brownish friable cakes. Merat and De Lens state that it is thus manufactured both in the Levant and at Marseilles. When exposed, it becomes white with an efflorescence of Benzoic (?) acid. Solid Storax is no longer officinal. *Liquid Storax* is usually more or less opaque, of the consistence of birdlime, greyish colour, warm balsamic taste, and peculiar vanilla-like odour.

The product of *Styrax officinale* is the genuine Storax of the ancients. It used to be obtained in fine tears, and was also packed in reeds (hence called *Calamita*). It was very unlike the sawdust-looking compound now sold. In 1708 Petiver gave a circumstantial account of the mode of obtaining Liquid Storax from the same tree, but he named an island in the Red Sea which unfortunately has no existence. M. Landerer, in 1839, stated that it was prepared from the *Styrax* at Rhodes. But this also has turned out to be an error. Liquid Storax is produced by trees of the genus *Liquidambar* (nat. ord. *Balsamaceæ*). *L. Styraciflua*, which inhabits Central America, Mexico, and the Southern United States, yields a kind of Storax, solid and liquid, in America. But Liquid Storax of English commerce comes from the Levant through Trieste, and it has been shown by the inquiries of Guibourt and Lindley, and, more recently, of Mr Daniel Hanbury, that it is the produce of *L. Orientale*, Miller. Mr Maltass, writing to Mr Hanbury from Smyrna, describes the trees as growing in large quantities near Melasso in Asia Minor, in the Gulf

Fig. 82.

of Genoa, and along the coast opposite Rhodes. In June and July the fragrant balsam is collected by a Turcoman tribe, who first strip off the outer bark and keep it for purposes of fumigation. They then scrape off the moist inner bark, and subject it to pressure in horse-hair bags, or boil it with water, and run off the balsam into barrels. It is apt to be adulterated with sand and ashes. It is purified by dissolving it in rectified Spirit, straining, and evaporating. Solid Storax may be freed from impurity in the same manner.

Liquid Storax has been analysed by Simon, and found to contain several peculiar substances. (1.) A Volatile Oil, called *Styrole*, having the formula $C_{16} H_8$, very volatile, burning with a sooty flame, and with the peculiar odour of Storax. (2.) *Cinnamic acid*, contained also in the balsams of Peru and Tolu. It resembles Benzoic, but may be distinguished from it by producing an odour of the Oil of Bitter Almonds when heated with Sulph. acid and Bichrom. Potash. (3.) *Styracine*, a crystalline neutral substance, soluble in alcohol and ether, but insoluble in water. (4.) Two peculiar resins. Storax yields little more than its odour to water, but is mainly dissolved by rectified Spirit.

Action. Uses.—Stimulant Expectorant in Chronic Coughs, in doses of gr. x.–gr. xx. It forms an ingredient of the Tinct. Benzoini Comp.

[PILULA STYRACIS COMPOSITA, L. Compound Storax Pill.

Prep.—L. Beat together *Prepared Storax* ʒvj. with *powdered Opium* and *Saffron* āā ʒij., that a mass may be formed.

Action. Uses.—Employed as a means of administering opium. 1 gr. of this is contained in 5 grs.]

BENZOINUM, B. Styrax Benzoin, *Dryander*. A resinous exudation from the stem. Benzoin. *Gum Benjamin*. (Imported from Siam and Sumatra.)

Benzoin has long been employed medicinally and as incense in the East. In Bengal it is called by a name (*looban*), which in N. W. India is applied only to Olibanum (*see* p. 382). In Persian works on Materia Medica it is distinguished by the names of *hussee looban* and *hussee-al-jawee* (*see* Himal. Bot. p. 261). The name *hussee* appears to be the original of *assa*, as mentioned at p. 463, and Benzoin we know is in old works called *asa dulcis*. Mr Marsden ascertained it to be yielded by a tree which Mr Dryander named Styrax Benzoin. Haynes supposed it to constitute a distinct genus, *Benzoin*, which Blume had already named Lithocarpus.

A tree of considerable size, but small when tapped, of quick growth. Branches and footstalks round, downy. Leaves oblong, acuminated, smooth above, white and tomentose underneath. Racemes compound, axillary, nearly as long as the leaves, flowers on one side with short pedicels. Calyx campanulate, obscurely 5-toothed. Corol of 5 petals of a greyish-white colour, which are perhaps united at the base, four times longer than the calyx. Stamens 10, inserted into the receptacle. Ovary superior, ovate, tomentose. Style filiform. Stigma simple.—Native of Java, Sumatra, Siam, and Laos, Borneo, &c.—Esenb. and Eberm. 111.

Benzoin is obtained in Sumatra by making incisions into the tree in its seventh year. The juice which flows first is the purest and most fragrant; it hardens on exposure to the air. That which flows subsequently is brownish, and some is scraped out when the tree is cut down and split open, as it is soon killed by the process of tapping. These varieties are in commerce called *head*, *belly*, and *foot* Benzoin, and have the relative values to each other of 105, 45, and 18, being esteemed according to their whiteness, semi-transparency, and freedom from admixtures. It is also produced in Siam, whence it has long been an article of commerce. The specimen given by Dr Royle to Dr Pereira, and named by him *Translucent Benzoin*, was obtained from Bankok. This may be produced by *Styrax Finlaysonianum;* but *S. Benzoin* may grow in the interior, as much surface moisture and umbrageous forests prevail, which will produce a climate very similar to that of a tropical island. *Benzoin in tears* is a fine kind, but seldom met with. The best kind common in commerce is in masses composed of whitish or reddish tears agglutinated together by a darker coloured portion of the same balsam. This is *Amygdaloidal Benzoin.* An inferior kind, of a dark-brown colour, is sometimes called Calcutta Benzoin. Though the history of some varieties requires investigation, this had no doubt been previously imported, as Benzoin is always mentioned as one of the imports into Calcutta, Madras, and Bombay, from countries still more to the eastward. Benzoin, though hard, is friable, presenting a resinous mottled fracture; has an agreeable, fragrant odour, more perceptible if rubbed; taste somewhat sweetish and balsamic, irritating the fauces if much chewed; its powder excites sneezing. Sp. Gr. 1·092. Heated, it melts, and emits white irritaing fumes of Benzoic acid, also of an empyreumatic oil, and finally burns away. It is soluble in Alcohol and in Ether, being precipitated on the addition of water, forming a milky emulsion. Some acids dissolve it. It consists of a trace of Volatile Oil, Benzoic acid, from 12 to 20 per cent., Resin from 78 to 80 per cent.—some of which is soluble, and another part insoluble in Ether—Woody matter, and Water. The White and Brown Benzoins contain nearly the same quantity of Benzoic acid; but the latter contains only about 8 per cent. of the soluble, and the White Benzoin very little of the insoluble resin.

Action. Uses.—Stimulant Expectorant. Formerly much employed in Chronic Catarrhs and in fumigations.

Tinctura Benzoini composita, B. Compound Tincture of Benzoin.

Prep.—B. Macerate for seven days in a close vessel with occasional agitation, *Benzoin* coarsely powdered ℥ij, *Prepared Storax* ℥jß, *Balsam of Tolu* ℥ß, *Aloes, Socotrine*, gr. clx. in *Rectified Spirit* Oj. Filter, and add Rect. Spirit to make Oj.

Action. Uses.—Stimulant expectorant, in doses of fʒß–fʒij. Sometimes made into an emulsion, or added to pectoral mixtures to improve their flavour. Formerly used as an application to sores and bruises, under the name of *Friar's Balsam.*

Acidum Benzoicum, B. Benzoic Acid.

Benzoic acid ($C_{14}\ H_5\ O_3 + Aq. = 122$), though named from Benzoin, is also produced by the action of reagents on several vegetable substances, as of an oxidising agent on the Oil of Bitter Almonds. It is considered to be an oxide of the hypothetical radical *Benzoyle* or *Benzule* ($Bz = C_{14}\ H_5\ O_2 = 105$). This has been already mentioned at p 437. The pure Oil of Bitter Almonds is a Hydruret of Benzule. When this is exposed to the atmosphere, Oxygen is absorbed, and some Benzoic acid formed. The latter is also formed in the Urine of some herbivorous quadrupeds by the decomposition of Hippuric acid. It is usually obtained from Benzoin, either by subjecting it to the action of heat or to that of a base, from which it is afterwards separated by a stronger acid. It used to be supposed that Benzoic acid was also an ingredient of the Balsams of Peru and Tolu, as well as of Storax. But it has now been proved that these contain another acid, analogous in its properties to Benzoic, viz., Cinnamic acid. Benzoic acid, when taken into the human system, undergoes the exact reverse of the change alluded to above as taking place in the Herbivora, being eliminated in the urine in the form of Hippuric acid.

Prep.—B. (1864.) Take of *Benzoin* ℥iv. Place the Benzoin in a cylindrical pot of sheet iron, furnished with a flange at its mouth; and, having fitted the pot into a circular hole in a sheet of pasteboard, interpose between the pasteboard and flange a collar of tow, so as to produce a nearly air-tight junction. Let a cylinder of stiff paper open at one end, eighteen inches high, and having a diameter of at least twice that of the pot, be now inverted on the pasteboard, and secured to it by slips of paper and flour paste. Pass two inches of the lower part of the pot through a hole in a plate of sheet tin, which is to be kept from contact with the pasteboard by the interposition of a few corks; and let a heat just sufficient to melt the Benzoin (that of a gas-lamp answers well) be applied, and continued for at least six hours, that Benzoic acid may be sublimed. Let the product thus obtained, if not quite white, be pressed firmly between folds of filtering paper, and again sublimed.

With the exception only of a trace of volatile oil, Benzoic acid is the only part of the Benzoin volatilised by heat.

Another mode of preparation is to boil powdered Benzoin with a solution of an alkaline Carbonate, or with Hydrate of Lime. The resulting liquid contains a soluble Benzoate, and Benzoic acid may be thrown down from it by the addition of Hydrochloric acid.

Benzoic acid, when obtained by sublimation, is in soft, feathery, flexible crystals, which have a pearly lustre, and, when pure, are quite colourless, but as obtained by the action of heat, have a little empyreumatic oil intermixed, which increases the odour, and does not impair the medical properties. From a solution, Benzoic crystallises in transparent prisms. It has a warm, acrid, slightly acid taste; a little volatilises at ordinary temperatures. It melts under 212°, and on a little increase of temperature sublimes entirely, and burns away; it is soluble in about 25 parts of boiling, and not less than 200 parts of cold water, but very readily in Alcohol; it combines with Alkalies and Metallic Oxides. It is composed of 1 Eq. Benzule 105 + 1 Eq. Oxygen 8 = 113 + 1 Eq. of Water when crystallised.

Tests.—White, or nearly so; by the cautious application of heat it is sublimed without residue, emitting a peculiar odour. Water dissolves it sparingly, but rectified Spirit readily. Solutions of Potash, Ammonia, Soda, or Lime dissolve it entirely, and Hydrochloric acid throws it down again.

Action. Uses.—Stimulant, Expectorant; may be given in doses of gr. v.–gr. xx., but is chiefly used as an ingredient of Paregoric (Tinct. Camphoræ cum Opio).

Inc.—Alkalies, their Carbonates and Metallic oxides.

Pharm. Prep.—Ammoniæ Benzoas, Tinct. Camphoræ Co., Tinct. Opii Ammoniata.

OLEACEÆ, *Lind.* Olive Tribe.

The Oleaceæ are found in the warm and temperate parts of the northern hemisphere, and a few in mountainous situations in India. They are valued for the hardness of their wood and ornamental flowers; the Olive tree also for its fruit and oil, and the species of Fraxinus for Manna.

Divided into two groups, {1. Oleineæ. Fruit drupaceous or baccate.
{2. Fraxineæ. Fruit capsular, indehiscent, samaroid.

OLEUM OLIVÆ, B. Olive Oil. Olea Europæa, *Linn.* European Olive. Oil expressed from the ripe fruit (in the South of Europe). *Diand. Monog.* Linn.

The Olive tree, ἐλαία of the Greeks, *Zait* of the Bible, and *Zaitoon* of the Arabs, is one of the most celebrated and useful of trees.

The Olive tree (fig. 83) is usually small, evergreen, but of a dull aspect; wood hard. Leaves with short petioles, ovate-lanceolate or lanceolate, mucronate, of a greyish-green colour above, hoary beneath. Flowers white, in short axillary clusters. Cal. (2) small, 4-toothed. Corol with short tube and 4-cleft limb (1). Stamens 2, a little exserted. Style short. Stigma (2) bifid, segments emarginate, Ovary 2-celled, 2-seeded. Drupe (3) about the size of a damson, purple-coloured, containing only one sharp-pointed nut.—A native probably of Asia, early cultivated in Syria and Greece. The varieties of the olive are numerous. The var. *longifolia* is chiefly cultivated in the south of France and Italy, and the var. *latifolia* in Spain.—Esenb. and Eberm. 212; St. and Ch. 15.

The leaves and bark of the Olive tree have been used in medicine; it produces a peculiar resinous exudation, called *Olivile* and *Olive gum;* and the bark has been employed as a substitute for Cinchona.

The fruit of the Olive—though esteemed, even in its unripe state, as an article of the dessert, for which purpose it is first steeped in an alkaline ley, and then preserved in salt and water—is chiefly valued on account of the bland fixed oil which is stored up in its outer fleshy part. This is obtained either by at once bruising the nearly ripe fruit with moderate pressure in a mill (*Virgin Oil*), or by the aid of boiling water and greater pressure, or after fermentation has taken place in the olives collected in heaps. In these latter ways *ordinary* and inferior oils are obtained, the worst being employed only as lamp-oils or in the manufacture of Soap. The finest oils are produced near Aix, Montpellier, Nice, Genoa, Lucca, and Florence. Olive oil is also largely produced in the kingdom of Naples, and exported from Gallipoli, on the east coast of the Gulf of Taronta, whence it is commonly called Gallipoli oil.

Olive oil may be taken as the type of the *Fatty* or *Fixed Oils*, called also *Expressed Oils*. It is of a pale yellow or light yellowish-green colour, without smell when fresh, having a bland, somewhat sweetish, fatty taste. It is very limpid. Sp. Gr. 0·910 at 77°. It is insoluble in water, readily dissolved by volatile oils, and by twice its bulk of Ether, but requires much more Alcohol.* Exposed to the air, it absorbs Oxygen and becomes rancid, but does not dry like Linseed oil, and is therefore preferred for machinery. At 36° F. it begins to congeal, and is readily separated at 20° into two distinct bodies, of which one is fluid, called *Elaine* or *Oleine*, and the other solid, named *Margarine* from its pearly aspect. This is often deposited in jars and casks of the oil. The Elaine forms about 72, the Margarine 28 per cent. Hyponitrous acid converts Olive oil into a concrete mass by producing the oleaginous principle, Elaidine, mentioned at p. 233. If this, or any other fixed oil, is heated with Alkaline solutions, or with the Oxide of Lead, great changes take

Fig. 83.

* Pure Olive oil is comparatively insoluble in alcohol, but if mixed with two or more volumes of Castor oil, which is soluble in alcohol, the two together may then be completely dissolved in Rect. Spirit, as ascertained by Dr Pereira. (P. J. ix. 502.)

place, as exemplified in the making of Soap (*see* Sapo) and of Lead Plaster, p. 190.

Tests.—Olive oil is apt to be adulterated with poppy and other oils; these are distinguished by not congealing at the same temperature as Olive oil, also by retaining air, when shaken up, more readily than pure Olive oil. Olive oil, when pure, may be completely solidified by ice. The E. P. stated that "when carefully mixed with a twelfth of its volume of solution of Nitrate of Mercury, prepared as for the Unguentum Citrinum (*see* p. 232), it becomes in three or four hours like a firm fat, without any separation of liquid oil." If 5 per cent. of any other oil be present, the consolidation is slower and less firm; but if there be 12 per cent., the foreign oil floats on the surface for several days. (*c.*) Oils of Poppy, Sesame, Rapeseed, or Cocoa-nut, are easily detected by this test. M. Gobley has invented an Elaïometer. (P. J. iii. 293.)

Action. Uses.—Nutrient, Emollient; given internally in irritant poisoning; externally relaxing, much employed for frictions and for embrocations, and to give consistence to Cerates, Ointments, and Plasters; a good application to the hair, from not drying readily. In doses of f℥j. laxative; added to enemata for its emollient effect, or to dislodge ascarides.

Contained in Linimentum Calcis and Lin. Camphoræ, and many ointments and plasters.

SAPO DURUS, B. Made with Olive Oil and Soda. Hard Soap. *Spanish* or *Castile Soap.*

The manufacture of Soap was known to the Romans, and has long been practised in India. It depends upon the action of Alkalies, and of oxide of lead, upon fixed oils and fatty substances. Hard, or, as it is often called, Castile Soap, is made by heating together Olive oil and a solution of caustic Soda. Combination gradually takes place, a viscid homogeneous mass is formed, which is readily soluble in water, and from this solution the Soap may be precipitated by a strong alkaline or saline solution. Soap, when of good quality, is white, does not stain paper (with oiliness), is free of odour, and dissolves entirely in rectified Spirit. It is horny and pulverisable when kept in dry warm air, easily moulded when heated. The mottled kind is less fit for medical use, because it is coloured by the addition of Sulphate of Iron, which becomes decomposed, and the black Protoxide, being precipitated, by the action of the oxygen of the air, is converted into the red Sesquioxide of Iron. Oleine and Margarine, of which most of the fixed oils are composed, consist respectively of two acids, *Oleic* and *Margaric*, in combination with a base *Glycerine.* In the process of saponification, these compounds are decomposed by an alkali. Soap is formed which consists of the alkali combined with these acids, as Oleate and Margarate of Soda or Potash. At the same time, Glycerine, which is soluble in water, is set free. The soap separates from the Glycerine and the alkaline ley with which it has been formed, when the latter is concentrated by heat, or when a solution of common salt is added by the manufacturer. It rises to the surface, and is skimmed off with ladles. Some oils and animal fats contain Stearine, a substance closely allied to Margarine: in that case some *Stearic acid* is contained in the soap. All Soaps are slightly alkaline, feel soft and slippery, and are detergent. The watery solution is readily decomposed by acids, also by earthy and many metallic salts; hence, when water holds any of them in solution, instead of dissolving, the soap becomes decomposed. Such waters are called *hard*, while those which are comparatively pure are called *soft* waters. Castile Soap is composed of 9 to 10·5 of Soda, 76·5 to 75·2 of Oleic and Margaric acids, and 14·3 to 14·5 of water (*Ure*). Common Soap, made of Tallow and Soda, and Yellow Soap, of Tallow, Resin, and Soda, are not so well adapted for medical use.

SAPO MOLLIS, B. Soft Soap. Made with Olive Oil and Potash.

Soft Soap, as used in the arts, is made with Caustic Potash, Fish-oil, and Tallow; is semi-transparent, of the consistence of honey, brownish-coloured, and nauseous. That made with Potash and Olive Oil, Dr Pereira was unable to meet with. He found on inquiry that common Soft Soap was usually substituted in the officinal preparations. Soft Soap made with Olive Oil is yellowish-white, inodorous, of the consistence of thick honey, entirely soluble in rectified Spirit, and not imparting an oily stain to paper. (B.)

Action. Uses.—Soap is Antacid, and hence used as an Antilithic; its alkali being readily set free, it is sometimes conveniently used in poisoning by acids, and given in large quantities without causing irritation. Or, its oily part being set free, it becomes useful in cases of habitual costiveness, especially when combined with Rhubarb, Aloes, or Colocynth Extract. Useful as a detergent in many cutaneous diseases,—and externally, from its lubricity, it is well suited for embrocations, &c., and is very commonly employed in liniments.

PIL. SAPONIS CO., B., contains 4 parts in 5 of Hard Soap.

Gr. v. contain gr. j. of Opium. (*See* Opium.)

LINIMENTUM SAPONIS, B. Soap Liniment. Opodeldoc.

Prep.—Take of *Hard Soap*, cut small, ℥ijß; *Camphor*, ℥j¼; *Oil of Rosemary*, f ʒiij.; *Rectified Spirit*, f℥xviij.; *Distilled water*, f ℥ij. Mix the Water with the Spirit, and add the Oil of Rosemary, the Soap, and the Camphor. Digest at a temperature not exceeding 70°, with occasional agitation for seven days, and filter. (In the L. P. of 1836 the proportion of Soap was much too large, in consequence of which the Liniment was apt to congeal in the cold, or even to form a jelly at ordinary temperatures. To remedy this, *Soft Soap* was frequently substituted by druggists.)

Similar to the form of preparation in the L. P. of 1851, except that the Rect. Spirit and Oil of Rosemary are used instead of the Spirit of Rosemary of the L. P. Mr Squire states that the ingredients are not entirely dissolved.

Action. Uses.—Stimulant Embrocation. A vehicle for Opium, &c.

LINIMENTUM OPII, B., contains Soap Liniment.

EMPLASTRUM CERATI SAPONIS, B. *Ceratum Saponis Compositum*, L. Soap Cerate or Plaster.

Prep.—B. Take of *Hard Soap*, in powder, ℥x.; *Yellow Wax*, ℥xijß; *Olive Oil*, Oj.; *Oxide of Lead*, ℥xv.; *Vinegar*, Cj. Boil the Vinegar and Oxide of Lead together, by the heat of a steam bath, constantly stirring them until the Oxide has combined with the acid; then add the Soap and boil again until most of the moisture, is evaporated; finally, add the Wax and Oil melted together, and stir the whole continuously, maintaining the heat until, by the evaporation of the remaining moisture the product has acquired the proper consistence for a plaster. (The latter part of the evaporation was omitted in the L. formula, a soft Cerate being produced.) Diacetate of Lead is first formed. The Soda then unites with the Acetic, and the fatty acid of the Soap and Oil with the Oxide of Lead. The Oil and Wax give consistence to the compound. The *soft* Cerate may be converted into *hard* Cerate, or *Emp. Cerati Saponis*, simply by evaporating away all the vinegar. (*See* P. J. iii. 36.) But this heat is likely to decompose the Glycerine of the Oil, causing the evolution of pungent vapours of Acroleine, and rendering the Cerate dark and acrid.

Action. Uses.—Mild application to Scrofulous and other sores. The *hard* Cerate is preferred by Dr Houlton to keep under dressings *in situ.*

EMPLASTRUM SAPONIS, B. Soap Plaster. (*See* PLUMBI OXIDUM.)

Action. Uses.—Discutient. Gives support and is little irritant.

Pharm. Prep.—Linim. Opii. Lin. Pot. Iodidi cum Sapone. Pil. Rhei Comp. Pil. Cambogiæ Comp. Pil. Scillæ Comp. Pil. Aloes. Barbadensis. Pil. Aloes et Assafœtidæ. Pil. Al. Socotrinæ. Pil. Scillæ Co. Ext. Colocynth Co. (All with *Hard Soap.*) Linim. Terebinthinæ. (*Soft Soap.*)

GLYCERINUM, B. Glycerine. A sweet principle obtained from fats and fixed oils.

This compound has already been mentioned as the base of fats and fixed oils, which usually consist of Oleate, Margarate, and Stearate of Glycerine, combined together in various proportions.

Prep.—To obtain it pure, the residuary liquor of a soap manufactory is evaporated, and treated with Alcohol. This dissolves out the Glycerine. The Spirit is then evaporated off, the Glycerine diluted with water, and boiled with Anim. Charcoal. This must be repeated until all colour and odour are extracted; or it may be made by evaporating the water left after making Emp. Plumbi, first passing through it a stream of H S to free it from lead.

When pure, the Glycerine is a colourless limpid fluid, of an oily feel, but mixing with water in all proportions, and soluble in Alcoho and Ether. Its composition is $C_6 H_8 O_6$. It has a sweet taste; whence its name. It has a Sp. Gr. of 1·25. It will not crystallise. When exposed to heat it first boils, and is then decomposed, giving off the acrid vapour of a volatile product called Acroleine.

Action. Uses.—It is used only as an external application, having emollient properties. Cotton wool, steeped in glycerine, has been recommended as an application to a diseased tympanum in some cases of deafness. It is also applied to chapped hands and sores.

MM. Cap and Garot have proposed to employ it in Pharmacy as a solvent for various medicines.

Accordingly various *Glycerines* or *Glyceroles* have been introduced in the B. P. 1867—*i.e.*, Solutions of Carbolic acid, Gallic acid, Tannic acid, Borax, in Glycerine (1 part in 4), and a jelly of Starch and Glycerine (1 part to 8).

MANNA, B. Fraxinus Ornus, *Linn.*, and F. rotundifolia, *DC.* Concrete exudation, from the stem, obtained by incisions. (From Sicily and the south of Europe.) Flowering Ash, and Round-leaved Ash. *Diand. Monog.* Linn.

The name Manna seems to be derived from the Arabic *mun*, signifying the same thing. But as there are several other sweetish exudations (*see* Manna, *Penny Cycl.*), it is difficult to determine when Manna was first known and used. There is uncertainty also respecting the species which yields European Manna. The Flowering Ash is the Fraxinus of the ancients, while the Common Ash is the Ornus of Virgil.

FRAXINUS ORNUS (*Ornus europea*, Persoon) is a tree about 25 feet high, with leaves which are impari-pinnate, consisting of 7 to 9 stalked, oblong-acute, serrated leaflets, which are hairy at the base of the midrib on the under side. Buds velvety. Panicles dense, terminal, nodding. Calyx very small, 4-cleft. Corol divided to the base into linear segments, which are white and drooping. Pericarp a narrow elongated capsule, which does not dehisce, terminated by a flat and obtuse wing. Hilly situations in south of Europe, especially Calabria and Apulia, also in Sicily.—Fl. Græca, i. t. 4; St. and Ch. 53.

F. ROTUNDIFOLIA, Lamarck (and Dec.), (*O. rotundifolia*, Persoon), has leaflets in 2–4 pairs, smooth, roundish or ovoid, obtusely serrated at the margin, and subsessile. Considered by some to be only a variety of the last. Grows in Calabria and the East.

Tenore asserts that Manna is yielded by this latter tree, which is generally cultivated on account of its Manna, and also by another species or variety named *F. garganica.* Professor Gusson assured Messrs Merat and De Lens that *F. rotundifolia* alone yielded Manna, and that this was frequently grafted on *F. Ornus.* Both this species and *F. rotundifolia* are natives of Calabria, Apulia, and Sicily; and it is from these places that we obtain our chief supplies of Manna. But other species of Fraxinus, and even *F. excelsior*, or the Common Ash, in the south of Europe, have been stated to yield Manna.

Manna is obtained chiefly by making incisions into the bark, and inserting leaves below them, in the middle of summer and in early autumn. The juice flows out as a clear liquid, and soon concretes on the stem and the leaves, as well as on straws stuck into them, forming stalactitical or *Flake Manna.* Some falls on leaves or into vessels placed for receiving it. Several kinds are known in commerce. *Manna in tears* is a pure kind, in bright and roundish white grains; but *Flake Manna* is chiefly valued and mostly met with in this country. It is obtained from Calabria and Sicily. It is in light and porous pieces, 5 or 6 inches in length, mostly stalactitical in nature, often hollowed on one side, of a pale yellowish-white colour, easily broken. The odour is faintish, the taste is mawkishly sweet, followed by slight acridity. Its colour changes to a yellowish-red when long kept. Inferior kinds are in smaller pieces, irregular in form, soft and sticky, of a yellowish-red or brownish colour, of an unpleasant sweetness, and often intermixed with impurities. These are called *Manna in sorts, Fat Manna, Tolfa Manna*, &c. Another set of Mannas is produced in Syria, Persia, and Arabia (*see* Manna, *Penny Cycl.*); but these are never met with in European commerce. Manna melts with heat, and burns with a bluish flame. When pure, it is soluble in 3 parts of cold and in its own weight of boiling water. It is also dissolved by rectified Spirit. Manna contains about 60 per cent. of a peculiar principle called *Mannite;* Sugar, of which some is crystallisable (*Thenard*) and some uncrystallisable, a little Gum, and some yellow nauseous Extractive, or *Resin*, which is supposed to be the purgative principle. *Mannite* may be obtained in acicular 4-sided crystals, sweet, without smell, soluble in water, less so in Alcohol, incapable of undergoing fermentation.

Action. Uses.—Laxative, active without irritation, but least active when fresh; apt, however, to create flatulence.

Dose.—℥j.-℥ij.; or for children, to whom it is suited from its sweet taste, gr. lx.-gr. cxx.

Pharm. Prep.—Confectio Cassiæ, L. Syrupus Sennæ, L.

The APOCYNEÆ contain a few plants possessing active and useful properties but none are officinal, as the *Strychneæ* are now referred to LOGANIACEÆ.

ASCLEPIADEÆ. Asclepia.

These are closely allied to *Apocyneæ*, and contain many plants which are possessed of useful medicinal virtues. *Cynanchum* (or *Solenostemma*) *Argel* has been already mentioned (p. 404) as employed to adulterate Senna. *Cynanchum monspeliacum* and *Periploca Secamone* are said to be used to adulterate Scammony. *Secamone emetica* and *Asclepias curassavica* are emetic. *Tylophora asthmatica* has been considered an efficient substitute for Ipecacuanha, and an excellent remedy in Dysentery. *Calotropos procera*, *aka* and *mudar* of the natives of India, has long been employed as an Alterative in Cutaneous affections, and even in incipient Leprosy. Dr Royle employed a variety named *C. Hamiltonii* by Dr Wight, which is common in North-west India, and which the natives there employ medicinally for the same purposes as the former. He has prescribed the fresh bark of the root, dried and powdered, alone and successfully in incipient cases of Leprosy and in other Cutaneous affections, both in the Civil and the Military Hospital at Saharunpore.

HEMIDESMI RADIX, B. Root of Hemidesmus indicus, *Dec.* (Imported from India.)

This has been long used in India in the same manner as Sarsaparilla, in the treatment of syphilitic, scrofulous, and cutaneous diseases. It was first introduced into England under the name of *Smilax aspera*, but it has no botanical affinity with the genus Smilax. It was first introduced in the D. P., from which the B. P. adopted it.

Hemidesmus indicus, R. Brown. (*Asclepias pseudo-sarsa*, Roxburgh).—A twining plant with smooth stem, leaves opposite, from cordate to ovate, passing into narrow linear, acute, often oblong, lanceolate, cuspidate. Cymes subsessile, or peduncled. Flowers small. Corolla rotate, 5-parted. Stamens 5. Filaments united at the base, distinct above. Anthers coherent, free from the stigma. Pollen in 20 masses, applied to the peculiar corpuscles of the stigma which characterise this group of plants. *Habitat*—Peninsula of India.

(The genus Hemidesmus belongs to the sub-order *Periploceæ* of R. Brown in which the filaments are partially or entirely distinct.)

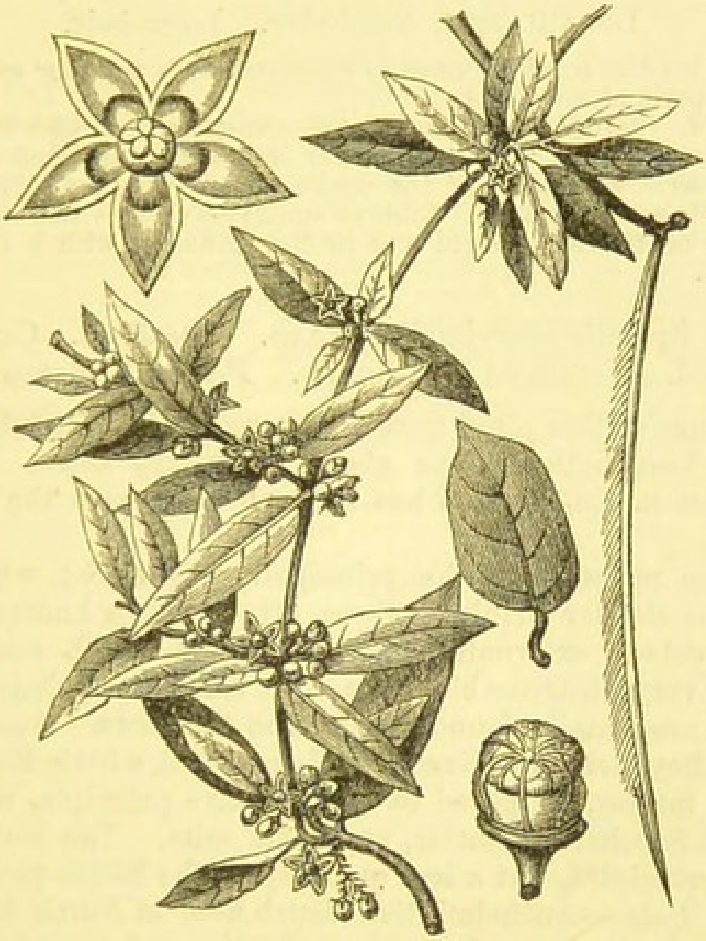

Fig. 84.

The root is imported from the Madras Presidency. It is in pieces of 10 to 12 inches long, about as thick as a large quill, with a rough reddish epidermis, a yellow inner bark, and a pale woody centre. The bark is furrowed, and splits into annular cracks. It has an agreeable taste and fragrant odour, compared to that of the Tonquin bean. It yields these properties to water. A volatile crystalline acid, called *Hemidesmic acid*, has been obtained from it.

Action. Uses.—Hemidesmus is preferred to Sarsaparilla by many officers on the Indian establishment, as tonic, alterative, and diaphoretic. Like Sarsaparilla, it is generally combined with more active medicines.

SYRUPUS HEMIDESMI, B. Syrup of Hemidesmus.

Prep.—Take of *Hemidesmus Root* bruised, ℥iv.; *Refined Sugar*, ℥xxviij.; *boiling Distilled water*, Oj. Infuse the Hemidesmus in the water, in a covered vessel, for four hours, and strain. Set it by till the sediment subsides; then decant the clear liquor, add the sugar, and dissolve by means of a gentle heat. The product should weigh 2 ℔ 10 oz., and should have the specific gravity 1·335.

Dose.—fʒj., diluted with water, when its agreeable odour recommends it as a vehicle.

LOGANIACEÆ, *Endlicher.* Loganiads.

This order may be briefly defined as Rubiaceæ with superior ovaries. They occur in hot parts of the world.

Sub-order I. SPIGELIEÆ, *Meesm.*—Are sometimes united with *Gentianeæ*, but are more allied to *Rubiaceæ*. Their leaves are furnished with stipulæ. Flowers isomeric, æstivation of the corols valvate, capsules didymous, many-seeded. Seeds without wings. Embryo small; cotyledons little conspicuous.—Warm parts of the New World and in New Holland, with a few species in tropical Asia.

SPIGELIA. Spigelia Marylandica, *Linn.* The Root. Carolina Pink. Wormseed. Perennial Wormgrass. *Pentand. Monog.* Linn.

The virtues of this plant were discovered by the Cherokee Indians, and made known in Europe about a century since. Being now seldom used in England, it has been omitted from the later Pharmacopœias.

Its active properties reside principally in the root, which consists of numerous slender wrinkled fibres, attached to a knotty head; of a brownish colour externally; having a faint smell, and a slightly bitter, not very disagreeable taste. As sold in the shops, the stalks and leaves are usually found attached to the roots. Analysed by M. Feneulle, they yielded a Fixed and Volatile Oil, a little Resin, a Bitter extractive matter, supposed to be the active principle, with Mucilaginous and Saccharine matter, and some salts. The leaves afforded the same principles, but a less quantity of the Bitter principle.

Action. Uses.—Anthelmintic. Much used in North America. In large doses it acts as an Irritant Cathartic, and in poisonous doses as a Narcotic. It may be given in powder gr. x.–gr. xx. to a child 3 or 4 years old; lx.–cxx. to an adult; or of the infusion (℥ß to boiling Aq. Oj.) fʒiv.–f℥j. may be given to a child. A quantity of Senna equal to the Spigelia is usually added, to insure a Cathartic effect. (*Wood and Bache.*) The Root of *S. Anthelmia* is similarly employed in Guiana and the West Indies as a remedy for ascarides.

Sub-order II. STRYCHNEÆ. Flowers regular. Æstivation of the corolla valvate. Embryo rather large. Trees or shrubs.

Tribe 2. *Eustrychneæ.* Berry or Drupe 2-celled, many-seeded, or from abortion 1-celled, 1-seeded, seeds peltate, apterous.

NUX VOMICA, B. Strychnos Nux Vomica, *Linn.* The Seeds. Nux Vomica, or Koochla tree. (Imported from the East Indies.) *Pentand Monog.* Linn.

Nux Vomica was early used as a medicine by the Hindoos. It is their *Koochla* tree (Sans. Culaka, and Kataka), and being a produce of India, its properties must have been investigated long before it could be known to foreign nations. It is the *Izarakee* of Persian works on Materia Medica, but there is doubt respecting its name in Avicenna. *Khanuk-al-kulb*, dog-killer, and *Faloos mahee*, fish-scale, are other Arabic names. But under the name of *Jouz-al-Kue*, or Emetic Nut, Dr Royle obtained in India the fruit of a Rubiaceous shrub. Dr Pereira thinks that the *Nux Mechil* of Serapion is *Nux Vomica;* but in Persian works this name is applied to a Datura.

A moderate-sized tree, with a short crooked trunk. Branches irregular, the young ones long and flexuose, with smooth dark-grey bark. Wood white, close-grained, and bitter. Leaves opposite, with short petioles, oval, smooth, and shining. 3 to 5-nerved, differing in size. Flowers small, greenish-white, in terminal corymbs. Calyx 5-toothed. Corol funnel-shaped; limb 5-cleft, valvate. Stamens 5; filaments short, inserted over the bottom of the divisions of the calyx; anthers oblong, half exserted. Ovary 2-celled, with many ovules in each cell, attached to the thickened centre of the partition. Style equal to the corol in length. Stigma capitate. Berry round, smooth, about the size of an orange, covered with a smooth, somewhat hard fragile shell, of a rich orange-colour when ripe, filled with a soft white gelatinous pulp, in which are immersed the seeds attached to a central placenta. Seeds peltate or shield-like, slightly hollowed on one side, convex on the other, about ¾ of an inch in diameter, and about 2 lines in thickness, thickly covered with silky ash-coloured hairs attached to a fibrous testa, which envelopes the kernel composed of horny bitter albumen of the form of the seed, and of the embryo imbedded in a hollow in its circumference.—Roxb. Coromb. i. t. 4. A native of the Indian Archipelago and of the forests of the Peninsula of India, as well as of the southern parts of the Bengal Presidency, as near Midnapore.—Esenb. and Eberm. 209; St. and Ch. 11. 52.

Lignum colubrinum, supposed to be an antidote against the poison of venomous snakes, as well as a cure for intermittent fevers, is produced by other species, as *Strychnos ligustrina* and *S. colubrina*. *S. tieute* yields the *Upas tieute* and *Tjettek* of the Javanese, which is an aqueous extract of the bark. *S. toxifera* yields the *Woorali* or *Ourari* poison of Guyana. *S. pseudo-quina* is employed in Brazil as a substitute for Cinchona Bark, and the seeds of *S. potatorum*, Roxb., *nirmulee* of the Hindoos, are employed by them to clear muddy water.

The seeds called *St Ignatius' beans* are frequently made to yield their Strychnia. They have been referred to a tree named *Strychnos Ignatia*, and *Ignatia amara*. Mr Bentham states that the genus *Ignatia* has no existence, and was established in mistake by the younger Linnæus. He believes that these seeds are produced by a species of *Strychnos*. They are ovate, triangular, of a reddish-grey colour, and about twenty of them contained in a pear-shaped fruit. They are produced in the Philippine Islands, and have long been used in India, where they are called *Papeeta*, and are mentioned in the work called Taleef Sheref. They are intensely bitter, and contain a larger quantity of Strychnia than the *Nux Vomica* seeds.

The wood of the *Nux Vomica* tree is said by Dr Christison to be often substituted for the above *Lignum colubrinum*, or Snake-wood. The bark is unfortunately sold in many shops in Calcutta under the name of *Rohun*, and thus substituted for the febrifuge bark of the *Rohuna tree* or *Soymida febrifuga* (Beng. Disp. pp. 247 and 437), which was made known by Dr Roxburgh, written on by Dr Duncan in 1794, and introduced into the E. P. In this way, probably, it came to be introduced into England, and not being found saleable, was sent to Holland, and there sold and used as Angustura bark (*see* p. 374), supposed at one time to be the bark of *Brucea ferruginea*. In 1804, Dr Ronbach of Hamburgh observed that it acted as a poison, and as several fatal cases occurred, it was in consequence prohibited from being used in many Continental states. From its composition, Batka suspected that it was the bark of the *Nux Vomica* tree, or of some allied species. This Dr Pereira confirmed by examining the specimens of *Strychnos Nux Vomica* in the East Indian Herbarium (Med. Gaz. xix. p. 492). Dr Christison, as he informed Dr Royle, came to the same result by examining specimens of *Nux Vomica* bark along with French specimens of false Angustura bark.

Dr O'Shaughnessy, in Calcutta, fully established the identity of false Angustura bark, and of the bark of the *Nux Vomica* tree, in Journ. of Med. and Phys. Soc. of Calcutta, Jan. 1837 ; having been led to it by the circumstance of an alkali having been obtained from what was supposed to be the bark of the *Soymida febrifuga*, but which proved to be the bark of *Strychnos Nux Vomica*. The whole forms a most instructive lesson on the absolute necessity of being thoroughly acquainted with the true nature of the drugs we prescribe.

Nux Vomica Bark is in flattish or slightly-curved pieces, thick, hard, and compact ; fracture dull and brownish ; epidermis sometimes displaying a ferruginous, spongy, and friable effloresence, at other times a yellowish-grey colour, marked with prominent greyish-white spots. Both appearances are due to alterations in the texture of the epidermis, and not to lichens, which are rare. The bark is smooth internally ; its powder of a yellowish-white colour, without smell, but having an intense and permanent bitter taste. A drop of Nitric on the external ferruginous part turns it of a dark-greenish colour ; but if applied to a transverse section or internally, a dark-red spot is produced. Analysed by Pelletier and Caventou, it yielded Brucia. Dr Christison states that it might also be employed for obtaining Strychnia. An infusion of the Bark slightly reddens Litmus ; Nitric acid produces it in a red, and Sulphate of Iron a green colour, but an Infusion of Galls a greyish-white precipitate.

Nux Vomica Seeds are round and flat, or rather shield-like, about an inch in diameter, umbilicated and slightly convex on one side, of a light-greyish colour, covered with a thick and tough testa, which is silky with fine hairs, which assist in detecting it when in powder and magnified. The seeds have little smell, but an intense and tenacious bitter taste ; they are so tough that the B. P. gives directions for powdering them (*see* Extract). The internal fracture is translucent. The powder, apt to be adulterated with substances employed to assist in pulverisation, is of a yellowish-fawn colour. Water takes up some, but proof and rectified Spirit nearly all its active properties. Analysed by Pelletier and Caventou, the seeds were found to contain two alkalies, *Strychnia* and *Brucia*, united with a peculiar acid, the *Igasuric* (called also Strychnic acid), a yellow Colouring matter, a Concrete Oil, Gum, Starch, Bassorine, and a small quantity of Wax. A third base, *Igasuria*, has lately been indicated (*see* below).

Action. Uses.—A powerful excitant of the spinal system of nerves. Poisonous, producing tetanic convulsions without affecting the brain.

Used as a stimulant of the Nervous System in Paralysis, in doses of the powder gr. v.–gr. xv.; or one of the following effective preparations may be employed.

Extractum Nucis Vomicæ, B. Extract of Nux Vomica.

Prep.—B. Take of *Nux Vomica* ℔j., *Rectified Spirit* a sufficiency. Apply steam to the *Nux Vomica* until it is thoroughly softened, then dry rapidly, and reduce to fine powder. Exhaust the powder by boiling it with successive portions of the Spirit until the latter comes off nearly free from bitterness. Strain, distil off the spirit, and evaporate by a water bath to the consistence of a soft extract. (A spirituous extract, resembling that of the L. P.)

Action. Uses.—A powerfully bitter-tasted extract. May be given in the form of pill in doses of gr. ß gradually increased to gr. iij.

Tinctura Nucis Vomicæ, B. Tincture of Nux Vomica.

Prep.—Powder *Nux Vomica* ℥ij. as directed above. Then with *Rect. Spirit* Oj. prepare as Tinct. Aconiti.

Introduced in the B. P. 1864. Not nearly so strong as a tincture which had long been in use. An efficient preparation, tonic in doses of ♏v.–♏x., nervous stimulant, ♏x.–♏xxx.

Strychnia, B. An alkaloid obtained from Nux Vomica. *Strychnine.*

Prep.—B. Take of *Nux Vomica*, ℔j.; *Acetate of Lead*, grs. clxxx.; *Solution of Ammonia*, a sufficiency, *Rectified Spirit*, a sufficiency, *Distilled water*, a sufficiency. Subject the Nux Vomica for two hours to steam in any convenient vessel; chop or slice it, dry it by the vapour bath or hot-air chamber, and immediately grind it in a coffee-mill. Digest the powder at a gentle heat for twelve hours with two pints of the Spirit and one of the Water, strain through linen, express strongly, and repeat the process twice. Distil off the spirit from the mixed fluid, evaporate the watery residue to about sixteen ounces, and filter when cold. Add now the Acetate of Lead, previously dissolved in Distilled water, so long as it occasions any precipitate; filter; wash the precipitate with ten ounces of cold Water, adding the washings to the filtrate; evaporate the clear fluid to eight ounces, and when it has cooled add the Ammonia in slight excess, stirring thoroughly. Let the mixture stand at the ordinary temperature for twelve hours; collect the precipitate on a filter, wash it once with a few ounces of cold Distilled water, dry it on the vapour bath, and boil it with successive portions of rectified Spirit, till the fluid scarcely tastes bitter. Distil off most of the spirit, evaporate the residue to the bulk of about half an ounce, and set it aside to cool. Cautiously pour off the yellowish mother-liquor (which contains the Brucia of the seeds) from the white crust of Strychnia which adheres to the vessel. Throw the crust on a paper filter, wash it with a mixture of two parts of rectified Spirit and one of the Water, till the washings cease to become red on the addition of Nitric acid; finally, dissolve it by boiling it with an ounce of rectified Spirit, and set it aside to crystallise. More crystals may be obtained by evaporating the mother-liquor.

The *Nux Vomica* is first reduced to powder in steaming and grinding. (Care must be taken not to use the mill just afterwards to grind coffee. Accidents which have occurred render this caution necessary.) The Igasurate, or natural salt of Strychnia, is dissolved out of the powder by the diluted spirit, which takes up at the same time Brucia with some colouring and gummy matters. These last are thrown down by the Acetate of Lead, which does not precipitate the Strychnia. The filtered fluid is now concentrated and precipitated by Ammonia. Strychnia is thrown down with a small quantity of Brucia. Much of the latter remains dissolved in the water, and some more is removed by the washing. The precipitate when dried is dissolved in rectified Spirit, and the solution evaporated to a small bulk, when the Strychnia crystallises out, leaving most of the Brucia (more sol. in spirit) in solution. The remainder of the latter is removed by washing the alkaloid with dilute spirit, &c. The product is very pure, but much of the alkaloid is lost by this careful process. (The L. P. of 1836 used Magnesia, the E. P. Lime as a precipitant. The D. P. employed Animal Charcoal to remove the colouring matter, which removed at the same time a large quantity of the Strychnia.)

By this process a crystalline powder is obtained, which amounts only to about 0·5 per cent. of the seeds according to Dr Taylor. Mr Horsley has obtained as much as 68 gr. from 1 lb. of Nux Vomica. (P. J. xvi. 179.) (St Ignatius' Bean yields about 1·2 per cent.) By the crystallisation out of Spirit, the Strychnia, which is the least soluble of the two, is separated from the Brucia, which remains in solution.

Strychnia when pure is white, crystallised in brilliant oblique octohedrons, or in elongated four-sided prisms; or it may be in a simple granular state. It is so intensely bitter that 1 part gives a perceptible taste to a million parts of water. It is very insoluble, requiring about 7000 parts of temperate, and 2500 parts of boiling water, is soluble in boiling rectified Spirit, in Ether and Chloroform, and in the fixed and volatile oils. But it is comparatively insoluble even in Alcohol and Ether. It may be extracted entirely from its dilute watery solution by boiling or simply digesting it with animal charcoal, which has a great affinity for it. It may be separated afterwards from the charcoal by means of alcohol. It is first fused by heat, and then decomposed. It is alkaline in its reaction on Litmus, and forms salts with acids, which are soluble and bitter. A white precipitate in solutions of these salts is produced by alkalies, and by Tannic acid. Gallic acid causes no change. Nitric acid colours it yellow; but if Brucia be present (as is always the case in commercial Strychnia), a red colour is produced. Strychnia consists of $C_{42}\,H_{22}\,N_2\,O_4$.

Tests.—Strychnia is apt to be adulterated; that in common use is never pure. It consists of Strychnia, Brucia, and some colouring matter. It should not be coloured red by Nitric acid (Brucia), nor by Sulphuric acid (Salicine). It should leave no ash when burned with free access of air. Its remarkable bitterness is one test for Strychnia.

"Pure $S\,O_3$ forms with it a colourless solution, which on the addition of Bichrom. Potash acquires an intensely violet hue, speedily passing through red to yellow." (B.) The test may be applied in this way: To a solution containing Strychnia are added, on a slab of white porcelain, a few drops of strong Sulph. acid, and then a little powdered Bichromate of Potash is dropped in at one point, when a bluish or violet colour is immediately produced, which spreads through the liquid, passes gradually into a reddish yellow, and becomes finally brown. By this test $\frac{1}{10000}$th ($\frac{1}{600000}$th, Dr De Vry) of a grain of the alkaloid may be detected. Most other alkaloids produce a grass-green colour with this test. (Eboli.) Strychnia produces a violet colour with a solution of Iodic acid; it forms a white precip. with Chlor. Mercury, Tannic acid, and Sulphocyanide of Potassium, yellow with Chromate of Potash. (*See* Dr Guy on "Colour Tests for Strychnia," P. J. new series, ii. and iii.)

BRUCIA, which resembles Strychnia in many points, crystallises in transparent crystals, or more usually in pearly scales. It is less bitter than Strychnia, and will dissolve in about 500 parts of water, and readily both in Alcohol and rectified Spirit. It is alkaline, and forms crystallisable salts with acids. Nitric' produces a deep-red colour when brought in contact with it;* but the red solution becomes violet on adding a solution of Protochloride of Tin. The colour is destroyed on the addition of deoxodising agents, as Sulphurous acid and Sulphuretted Hydrogen. It is composed of $C_{46}H_{26}N_2O_8$; the crystals contain seventeen per cent of water. Dr Fuss, as quoted by Pereira, considers Brucia a compound of Strychnia and yellow Colouring matter. It may be employed for the same purposes as Strychnia, but is not above $\frac{1}{12}$th its strength; and may be given in gr. $\frac{1}{4}$–gr. v.

Desnoi has described a third base as existing in the mother-liquor from which Strychnia and Brucia have been precipitated. He has named it Igasuria. It may be obtained in silky needles, of a very bitter taste. It dissolves in 200 parts of boiling water, while Brucia requires 500. It further differs from the latter in being precipitated by Bicarb. Potash from its solution when Tartaric acid is present. (*Journal de Pharm. et de Chim.* 25., 202.) Lastly, Schutzenberger has shown that this Igasuria consists of a number of distinct bases, differing in composition, and in the degree of their solubility in water. He has distinguished at least nine of these alkaloids.

Action. Uses.—Strychnia acts exactly as Nux Vomica, and may be employed for the same purposes, but only in doses of $\frac{1}{30}$th or $\frac{1}{20}$th of a grain, very gradually increased to $\frac{1}{12}$th or more. The first effects experienced from medical doses are twitches in the muscles of the extremities, often during sleep, and frequently first in the paralysed part. Some improvement of the digestive functions is often experienced. But in larger doses, tetanic spasms ensue, and a tendency to lock-jaw, with transient intervals of relief. When the first twitches are experienced, it is necessary to intermit the use of the medicine, as the constitution does not become accustomed to its use, and some cases show a tendency to its being cumulative in its action. It is so powerful a poison, that a girl thirteen years of age was killed in about an hour by accidentally taking $\frac{3}{4}$ of a grain divided into three pills. (Edin. Med. Journal.)

On account of the strongly-marked chemical tests which distinguish it, and its very peculiar action on man and animals, it is fortunately not difficult to recognise cases of poisoning by this alkaloid, which have been commoner since the penal enactment against the

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* See *Chemist*, new series, ii. 27, for an account, by Strecker, of the decomposition that takes place on this reaction.

use of white Arsenic. Dr M. Hall considers its action on the frog the most delicate test for Strychnia. As small a quantity as $\frac{1}{1000}$th of a grain, diffused in the water in which the animal is immersed, will cause violent tetanic convulsions.

The best antidote to Strychnia in poisoning cases is Animal Charcoal in large quantity, which absorbs and fixes the alkaloid. Professor Kurzak recommends Tannic acid.

LIQUOR STRYCHNIÆ, B. Solution of Strychnia.

Prep.—Take of *Strychnia*, in crystals, gr. iv.; *Dilute Hydrochloric acid*, ♏vj.; *Rectified Spirit*, fʒij.; *Distilled water*, fʒvj. Mix the Hydrochloric acid with ʒiv. of the Water, and dissolve the Strychnia in the mixture by the aid of heat. Then add the Spirit and the remainder of the Water.

This solution of the Hydrochlorate of Strychnia, introduced in the B. P., affords a means of administering with safety small doses of the alkaloid (*see* Liquor Aconitiæ). It contains 1 grain in 2 drachms. Each drop contains $\frac{1}{120}$th grain. 12 drops contain $\frac{1}{10}$th of a grain.

Dose.—♏ij.–♏v., gradually increased to ♏x., or more.

(Care must be taken by druggists that this alkaloid be not placed on the shelves near Quinine, Salicine, and other substances which superficially resemble it, and that this poisonous colourless fluid be also kept apart.)

GENTIANEÆ, *Juss.* Gentianads.

The Gentianeæ are found in temperate and cold climates, often in mountainous situations. They are remarkable for the secretion of a bitter principle, which makes many of them useful as tonics.

1. *Gentianeæ veræ.*	Corol twisted to the right in æstivation. Leaves opposite.
2. *Menyantheæ.*	Corol plaited in æstivation. Leaves alternate. Marsh plants.

CENTAURIUM. Erythræa Centaurium, *Pers.* The Flowering-heads. Common Centaury. *Pentand. Monog.* Linn.

This is the κενταύριον τὸ μίκρον, or Small Centaury of Dioscorides. It is a good indigenous tonic, but is not mentioned in the B. P.

This is a small herbaceous plant, with opposite leaves, upright stem, and a terminal corymb of pink flowers. It is common on English pastures, and flowers from June to August.

All parts of this plant possess a pure bitter taste, but the flowers in a less degree. It is suited for all the purposes for which the bitter tonics are indicated. It yields its properties both to water and to Spirit.

Action. Uses.—Tonic; may be given in powder gr. xxx. or in infusion (℥ß in Aq. Oj.) in doses of f℥jß.

GENTIANÆ RADIX, B. Gentiana lutea, *Linn.* The Root, dried. Yellow Gentian. *Pentandria Digynia*, Linn.

Gentiana is the Γεντιανή of the Greeks, called *juntiana* in the works of the Arabs.

Root thick, perpendicular, often forked, brown externally, yellowish within. Stem straight, 2 to 3 feet in height. Radical leaves ovate-oblong, 5-nerved; stem leaves sessile, ovate-acute; those supporting the flowers cordate, amplexicaul, concave, all of a pale glaucous-green colour. Flowers (fig. 85) in an interrupted spike of whorls, large, of a brilliant yellow. Calyx membranous, spathelike, 3 or 4-cleft. Corol rotate, with 5 or 6 green glands at its base, 5 or 6-parted, divided usually into 2 acute veiny lobes. Stamens 5; anthers straight, subulate. Style wanting. Stigmas 2, revolute. Ovary and capsule fusiform, 1-celled. Seeds roundish, compressed, with a membranous border.—A native of the Alps, Apennines, and Pyrenees, and other mountains of Europe.—Esenb. and Eberm. t. 199; St. and Ch. 132.

Other species also yield some of the Gentians of commerce, as the Alpine species, *G. purpurea*, *punctata*, and *pannonica;* while in the Himalayas *G. Kurroo* yields a similar product. *G. purpurea* is thought to yield the kind of root which is sometimes sold under the name *radix Gentianæ rubræ.*

The root, which is supplied from Germany and Switzerland, being collected in the Alps, Apennines, and other mountainous districts of Europe, is the only officinal part. France is supplied from Auvergne, &c. It varies in dimensions, but is usually about the thickness of the thumb, and several inches in length; often a little twisted and wrinkled; of a brownish colour externally, yellowish within; rather soft, but tough; the odour feeble, but the taste at first slightly sweet, then of an intense but pure bitter. The properties are imparted readily to Water, Spirit, Wine, and Ether. The roots contain a bitter Extractive matter (*Gentianine*), Gum, Sugar, Pectine, Wax, Caoutchouc, a fixed Oil, Yellow Colouring matter, a trace of Volatile Oil, and an acid which has been named *Gentisic*,—which, when quite

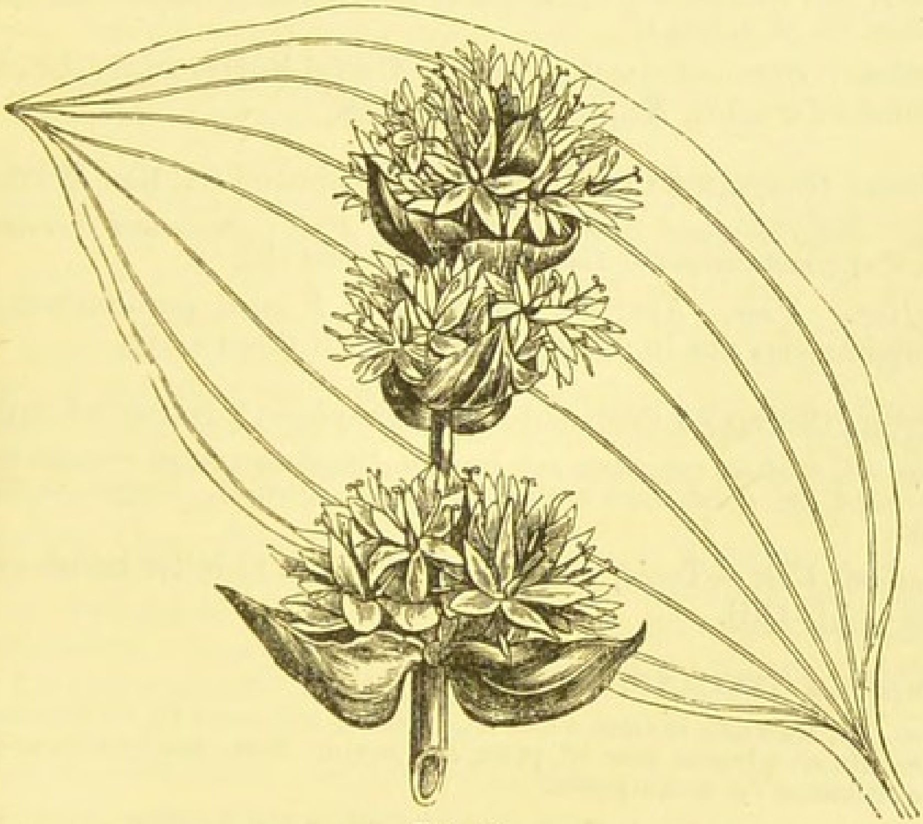

Fig. 85.

pure, is colourless, and tasteless, in feebly acid crystals. Owing to the presence of Sugar, &c., Infusion of Gentian ferments with yeast, and yields a bitter distilled Spirit, prized by the Swiss and Tyrolese as a Stomachic.

Action. Uses.—A Bitter Tonic; esteemed in Dyspepsia and in Convalescences. Like others of the same class, sometimes employed as an Antiperiodic and Anthelmintic.

Dose.—Of the Powder gr. x.–gr. xxx., 3 or 4 times a-day.

INFUSUM GENTIANÆ COMPOSITUM, B. Compound Infusion of Gentian.

Prep.—Take of *Gentian Root* sliced, *Bitter Orange Peel* cut small, āā gr. lx.; *fresh Lemon Peel* cut small, ℥¼; *boiling Distilled water*, f℥x. Infuse in a covered vessel for one hour, and strain. (Same as L. P., restored in 1867.)

MISTURA GENTIANÆ, B. Gentian Mixture.

Prep.—B. Take *Gentian* sliced, ℥¼; *Bitter Orange Peel* cut small, gr. xxx.; *Coriander* bruised, gr. xxx.; pour on *Proof Spirit* ℥ij. in a covered vessel; in two hours add cold *Dist. water* ℥viij., and in two hours more strain through calico. (Inf. Gent. Co. of B. 1864.)

Action. Uses.—Aromatic Tonics. Useful in Dyspepsia, &c., and as vehicles for acids, &c., in doses of f℥jß.

[MISTURA GENTIANÆ COMPOSITA. L. Compound Gentian Mixture.

Prep.—Mix *Compound Infusion of Gentian*, f℥xij.; *Compound Infusion of Senna*, f℥vj.; and *Compound Tincture of Cardamoms*, f℥ij.

Action. Uses.—Aperient and Tonic. A good combination for extemporaneous use in doses of f℥jß, 2 or 3 times a-day.

TINCTURA GENTIANÆ COMPOSITA, B. Compound Tincture of Gentian.

Prep.—B. *Gentian*, cut small and bruised, ℥iß; *Bitter Orange Peel*, cut small and bruised, ℥¾; *Cardamoms* bruised, ℥¼; *Proof Spirit* Oj. Prepare as Tinct. Aconiti.

Action. Uses.—Tonic, Stomachic. Adjunct to bitter infusions, in doses of ʒj.–fʒij.

EXTRACTUM GENTIANÆ, B. Extract of Gentian.

Prep.—B. Macerate *Gentian*, sliced ℔j. in *boiling Dist. water* Cj. for two hours; boil for fifteen minutes, pour off, press, and strain. Evaporate by a water-bath to a consistence for making pills.

Action. Uses.—Tonic in doses of gr. v.–gr. xx. in pills, often given with metallic salts.

CHIRATA, B. Ophelia Chiarta, *Griseb.* The entire plant (collected in Northern India). Chiretta. *Tetrand. Monog.* Linn.

The bitter called *Chiretta*, or *Chiraeta*, is as universally employed throughout the Bengal Presidency as Gentian is in Europe. It has long been known to the Hindoos, but there is no reason to suppose it to be the *Calamus aromaticus* of the ancients. (*See* Himal. Bot.

p. 277.) The first English account is that of Dr Fleming (in Asiat. Res. xi. p. 167), who referred it to the genus Gentiana, others to Swertia, and the late Professor Don to Agathotes; Grisebach now refers it to Ophelia. It is often confounded with another powerful Indian bitter, that is, Creyat, or *Justicia paniculata*. But there are several plants closely allied to the Chiretta, which are used for the same purposes, as stated in Him. Bot. p. 277. Thus, *Ophelia* (*Swertia*, Wall.) *angustifolia*, Don, is so in Northern India, and called *puharee* (*i.e.* hill) *chiretta*, to distinguish it from the true or *dukhunee* (southern) *chiretta*. This is obtained from Nepal. *Exacum tetragonum* is called *ooda* (that is, purple) *chiretta*.

It is an annual, of from 2-3 feet high, with a single, straight, round, smooth stem. Branches generally decussated, nearly erect. Leaves opposite, amplexicaul, lanceolate-acute, smooth, 5-7 nerved. Flowers numerous, stalked, upper half of the plant forming elegant decussated umbel-like cymes, with 2 bracts at each division. Calyx 4 cleft, with sublanceolate persistent divisions, shorter than the corolla. Corol yellow, rotate, limb 4-parted, spreading, withering in æstivation, twisted to the right, with 2 glandular hollows protected by a fringed scale upon each segment. Stamens 4; filaments subulate, shortly connected at the base; anthers cloven at the base. Style single. Stigma large, 2-lobed. Capsules conical, rather shorter than the permanent calyx and corol, 1-celled, 2-valved, opening a little at the apex. Seeds numerous, affixed to two receptacles adhering to the sides of the valves.—Himalaya mountains, of which Nepal is one of the valleys.—Wall. Pl. As. Rar. 3, p. 33, t. 252.

Chiretta is met with in a dried state, tied up in bundles, with its stems of a brownish colour, about 3 feet long, and of the thickness of a goosequill, having the roots attached, which have been taken up when the plant was in flower. The whole plant is bitter. Mr Battley states that it contains—1. A free Acid. 2. A very Bitter Extractive and Resinous matter, and much Gum. 3. Hydrochlorate, and Sulphate, of Lime and of Potash. He considers that the Spirituous Extract is more aromatic than that of *Gentiana lutea*, but that the extractive and the gum are in larger proportion in the latter. Water and Spirit take up its active properties.

Action. Uses.—Bitter Tonic; Stomachic in Dyspepsia, or as a Tonic in Convalescence; in either cold or hot infusion; the former is lighter, well suited to Dyspeptics, and not so apt to create nausea in a hot climate. Sometimes a little Orange peel or Cardamon is added. The tincture also may be used.

INFUSUM CHIRATÆ, B. Infusion of Chiretta.

Prep.—Infuse in a covered vessel for half an hour *Chiretta*, cut small, ℥¼, in *Dist. water* at 120° ℥x. Strain.

Action. Uses.—Stomachic in doses of f℥jß–f℥iij. to be taken before dinner, or twice a-day.

TINCTURA CHIRATÆ, B. Tincture of Chiretta.

Prep.—Cut small and bruised *Chiretta* ℥ijß in *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Dose.—fʒj–fʒiij.

MENYANTHES. Menyanthes trifoliata, *Linn.* The Leaves. Buckbean or Marsh Trefoil. *Pentand. Monog.* Linn.

The Buckbean, though long employed, is now but seldom used in European medicine.

A handsome herbaceous plant, floating on water, or growing in marshes, in England, Cashmere, and most parts of Europe and North America. It has large long-stalked ternate leaves, and a lilac-coloured raceme of flowers, with corollæ bearded internally.

The stem and leaves are smooth, with little odour, but have a very bitter, somewhat nauseous taste. The expressed juice contains, according to Trommsdorff, a very bitter azotised Extractive (*Menyanthine*), a brown Gum, Inuline, Green Fecula, Malate and Acetate of Potash, and about 75 per cent. of water. Water and Alcohol take up its active properties.

Action. Uses.—A Bitter Tonic; in large doses, Cathartic and Emetic. Doses of the powdered leaves gr. xx., or of the Infusion (℥ß to Aq. Oj.) f℥jß, 2 or 3 times a-day.

CONVOLVULACEÆ, *R. Brown.* Bindweeds.

The Convolvulaceæ are allied to Polemoniaceæ, Solaneæ, and Boragineæ. They abound in the plains and valleys of hot and tropical countries: some are found in the driest situations. The stems of many being annual, a few come to perfection in the summer of higher latitudes. Many are remarkable for the secretion of purgative principles, as in the Jalap, Scammony, Turpeth, *Ipomœa cœrulea*, &c.

JALAPA, B. Exogonium Purga, *Benth.* The tubers, dried. (From Mexico.) *Purga* of the natives of Jalapa. Jalap Root.

Jalap has been known to Europe since 1609, having been introduced into England from the Mexican town of Jalapa, whence it has its name. It was at one time supposed to be produced by *Mirabilis Jalapa*, and then by *Convolvulus Jalapa*, Linn., called also *Ipomœa macrorhiza*, Mich. But all these grow in hot countries, while the Jalap, as long since stated by Humboldt (New Spain, vol. iii. p. 36), or the true "*Purga de Xalapa*, delights only in a temperate climate, or rather an almost cold one, in shaded valleys, and on the slopes of mountains." The true Jalap plant seems to have been first sent from Mexico by Dr Houston; at least, seed sent by him produced a plant which Miller has described in the 6th ed. of his Gardeners' Dict. as having smooth leaves, while the leaves of the other plant, or *Convolvulus* (now *Batatas*) *Jalapa*, are downy, especially on their under surface. In 1827, Dr Coxe, Prof. of Mat. Med. in Pennsylvania, received from Xalapa several growing roots of the Jalap plant. Mr Nuttal described them by the name of *Ipomœa Jalapa*, in Am. Journ. of Med. Sc. v. p. 300, Feb. 1830. Living roots were sent by Dr Coxe to Dr A. T. Thomson, and the description was inserted in his Dispensatory in 1831. The same plant is referred to by Mr Don's MS. name in the L. P., 1836. About the same time, or a little later, Ledanois sent the root to Paris; and Scheide, travelling in Mexico, collected at Chiconquiera on the eastern declivity of the Mexican Andes, at an elevation of 6000 feet, living plants and seeds of the true Jalap, and sent them to Germany, where they were cultivated, and the plant named *Ipomœa Purga* by Wenderoth, Nees, Off. Pfl. Suppl. iii. t. 16; *I. Scheideana* by Zuccarini, Plant. Nov. fasc. i. t. 12; *I. officinalis* by G. Pelletan in France; and *Exogonium Purga* by Mr Bentham. Dr Lindley says, "From an unpublished letter in the possession of the Horticultural Society of London, from Don Juan de Orbegozo, a pupil of Cervantes, residing at Orezaba, it appears certain that this plant furnishes the Jalap of commerce." The plant is now cultivated in the open air on the Continent, at the gardens of the Horticultural Society, and that of the Society of Apothecaries. Dr Royle, by the liberality of the Hort. Soc. and of Dr Balfour, was enabled to send the roots to the Himalayas.

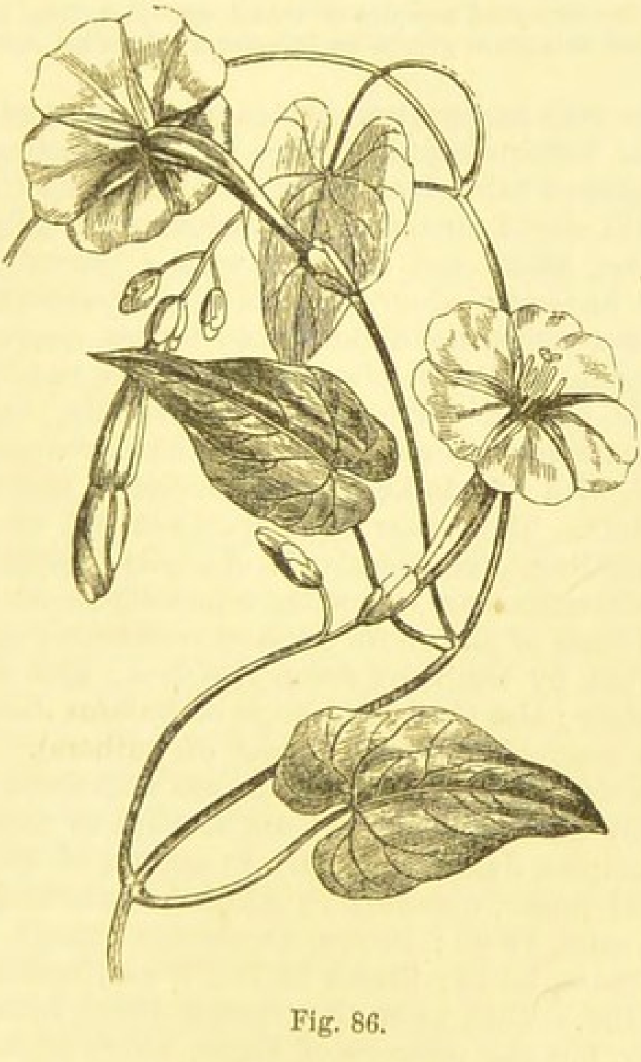

Fig. 86.

Exogonium (or *Ipomœa*) *Purga* (fig. 86). The true Jalap plant has a tuberous, fleshy root-stock, with numerous pear-shaped tubers, externally brownish coloured, internally white, with numerous long fibres. The stem, climbing to a great extent, is of a brownish colour, round and smooth, without downiness. Leaves on long foot-stalks, cordate, with a tendency to become hastate in the lower leaves, deeply sinuated at the base, and acuminate at the apex, entire very smooth. Peduncles axillary, 2-flowered, commonly only one blown at a time. Calyx without bracts; sepals 5, obtuse, mucronate, with 2 of them external. Corolla of a crimson or a light-red colour, with a long rather clavate tube, four times longer than the calyx; limb undulated, with five plaits; lobes obtuse, subemarginate. Stamens 5; filaments smooth, unequal, longer than the tube of the corol, with white, linear, exserted anthers. Stigma capitate, deeply furrowed. Capsule 2-celled; cells 2-seeded.—On the eastern declivity of the Andes of Mexico, at an elevation of about 6000 feet, where the climate is rainy, but subject to frost in winter. Flowers in August and September. The tubers are gathered chiefly in the spring, when the young shoots are springing.—Nees and Eberm. Sup. 3, t. 13; Zuccarini, Plant. Nov. Fasc. 1, t. 12.

Ipomœa mestilantica, Choisy. Dec. Prod. ix. 389, *I. orizabensis* of Pelletan is another plant, closely allied to the former, and grows in the temperate parts, of the state of Oaxaca. Dr Lindley (Fl. Med. p. 397) supposes that it may be the *Convolvulus orizabensis* of Pelletan, which Dr Scheide had heard of under its Spanish name of *Jalapa Macho* or *Purga Macho*, or Male Jalap; but he had only seen the root, which appears very like that of *E. Purga*. Don. J. de Orbegozo, as quoted by Dr L., states that this is considered by the traders in Jalap to be extremely similar in quality, and as "it is the more abundant and larger of the two, at least in some districts," the probability is that it also forms a part of the imported samples of this drug.—Bot. Reg. 1841, t. 36. Dr Pereira states that this plant yields an inferior kind, called *light*, *fusiform*, or *male* Jalap.

Jalap tubers vary in size from a walnut to an orange; are usually pear-shaped or turnip-shaped, having often projecting from them smaller horn-shaped tubercles; the surface being smooth, corrugated, or marked with slight furrows. The colour externally is blackish-grey. They are heavy and compact, with a brownish fracture, a very peculiar nauseous odour, and an acrid pungent taste. The larger tubers are sometimes divided into halves, quarters, or disks, and are always marked with circular or vertical incisions, made to facilitate their drying. When cut transversely, the section, if polished, appears very compact, and has the appearance of a deep-coloured wood, with still darker concentric circles, and many shining lines and points. The odour of Jalap, when cut or powdered, is strong and irritating. The powder is of a pale brownish colour.

Several adulterations are met with, especially in continental commerce, as the roots of the above *Ipomœa orizabensis*, called Stalk or Light Jalap, but by Guibourt *Jalap fusiform;* also a *False Jalap with a rose odour;* also the smaller roots of *Batatas Jalapa* of Choisy (*Convolvulus macrorhizus* and *Jalapa* of authors). Roots of a *Bryonia*, of a *Smilax*, and of *Mirabilis*, are sometimes intermixed.

Analysed by Guibourt, who did not attempt to ascertain all the salts and principles, Jalap was found to contain of Resin 17·65 per cent., a liquid Sugar, obtained by Alcohol, containing some of the deliquescent salts, 19·00; Brown Saccharine extract, obtained by water, 9·05; Gum, 10·12; Starch 18·78; Woody matter, 21·60; loss being 3·80 = 100. This, as M. G. remarks, differs from the analyses hitherto given, but the presence of Sugar, which he supposes to be of the nature of Cane Sugar, approximates Jalap to Batatas and other Jalap (as Rose Jalap) roots of the same family, which contain it. The Cathartic properties depend on the Resin; hence, rectified Spirit is the best solvent. Water takes up the Gum and Starch, with little of the active principle. Though Jalap is apt to be attacked by insects, its virtues are not in consequence impaired, for they leave untouched the resinous part. This Resin is of a greyish colour, opaque, brittle, acrid in taste, soluble in Alcohol, scarcely in Ether, readily in Nit′ or Ac′, and in solution of Potash. Alkalies form it into an acid which is soluble in water. The solution of Jalap resin in an alkali should give no precipitate with $S\,O_3$. This is an important test of its purity. It is now often adulterated with Guaiacum, which may be detected by the blue colour produced by Nitrous gas, and by being soluble in Ether, which does not dissolve pure Resin of Jalap. Dr Kayser has named this *Rhodeoretine*, from its producing a red colour with strong Sul′. He considers it composed of $C_{42}\,H_{35}\,O_{20}$. The presence of a peculiar acid, called *Jalapic*, analogous to the fatty acids, has been indicated by some.

PULVIS JALAPÆ COMPOSITUS, B. Comp. Jalap Powder.

Prep.—B. *Jalap* in powder, ℥v.; *Acid Tartrate of Potash*, ℥ix.; *Ginger* in powder, ℥j. Mix thoroughly, pass through a fine sieve, and finally rub lightly in a mortar.

Action. Uses.—Hydragogue Cathartic; useful in habitual Costiveness, &c., in doses of gr. xx.–gr. lx.

TINCTURA JALAPÆ, B. Tincture of Jalap.

Prep.—B. *Jalap* in coarse powder, ℥ijß; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Contains the Resin of Jalap, with some of the principles soluble in water.

Action. Uses.—Cathartic adjunct to Purgative draughts, in doses of fʒj.–fʒij.

EXTRACTUM JALAPÆ, B. Extract of Jalap.

Prep.—Take of *Jalap*, in coarse powder, ℔j.; *Rectified Spirit*, Oiv.; *Distilled water*, Cj. Macerate the Jalap in the Spirit for seven days; press out the tincture, then filter, and distil off the spirit, leaving a soft extract. Again macerate the residual Jalap in the Water for four hours, express, strain through flannel, and evaporate by a water bath to a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding 140° to a proper consistence.

This extract is analogous to that of the L. P. It contains the matters soluble in water (saccharine and gummy matter, &c.) as well as those soluble in spirit (resin). The lignin, and most of the starch and impurities, are left.

Action. Dose.—Purgative, in doses of gr. x.–gr. xx.

RESINA JALAPÆ, B. Resin of Jalap.

Prep.—Take of *Jalap*, in coarse powder, ℥viij.; *Rectified Spirit*, a sufficiency; *Distilled water*, a sufficiency. Macerate the Jalap with f℥xvj. of the Spirit in a covered vessel, at a gentle heat, for twenty-four hours; then transfer to a percolator, and, when the tincture ceases to pass, pour into the percolator successive portions of Spirit until the Jalap is exhausted. Add to the tincture f℥iv. of the Water, and distil off the Spirit by a water bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the Resin, wash this two or three times with hot water, and dry it on a porcelain plate by a stove or water bath.

Action. Uses.—This contains only the Resin, or active part of Jalap, and is thus a more efficient cathartic than the last.

Dose.—Gr. iij.–gr. v., or gr. x. (It resembles the late extract of the E. P.)

M. Keller has named this resin *Convolvulin*, and determined for it the formula $C_{62}H_{50}O_{32}$. He considers it to be composed of Glucose and a substance named Convolvulinol.

SCAMMONIÆ RADIX, B. Convolvulus Scammonia, *Linn.* The dried Root. (From Syria and Asia Minor.) Scammony Root.

SCAMMONIUM, B. Gum Resin, obtained by incision from the living Root. Scammony.

Scammony has been employed in medicine since the time of Hippocrates. It is called *suk moonya* by the Arabs. Several varieties may be met with in commerce.

The *Scammony Convolvulus* has perennial tapering roots from 3 to 4 feet long, and from 9 to 12 inches in circumference, fleshy, and abounding in acrid milky juice. Stems numerous, annual, round, slender, smooth, twining over neighbouring plants, and to a great exent over the ground. Leaves petioled, quite smooth, entire, oblong, arrow-shaped, truncate, and angular at the base, with acute spreading lobes. Peduncles axillary, solitary, 3-flowered, about twice the length of the leaves. Sepals rather lax, smooth, ovate-obtuse, with a reflexed point. Corol campanulate, much expanded, of a pale sulphur-yellow colour, three times as long as the calyx. Stamens 5, erect, converging, about a third of the length of the corol. Style equal to the stamens. Stigmas white, oblong, erect, parallel, distant. Ovary 2-celled, 4-seeded. Capsule 2-celled. Common in Greece and the Levant.—Esenb. and Eberm. 195.

A Convolvulus, which is also called *C. Scammonia*, found by Captain D'Urville, in the island of Cos, having yellow flowers with reddish bands (Fl. Med. t. 317), is supposed to yield Scammony. Tournefort informs us that an inferior Scammony is obtained in Natolia, whence it is sent to Smyrna, and hence called Smyrna Scammony. Sibthorp says that Scammony is produced by two different species of Convolvulus, one the above *C. Scammonia*, and the other (perhaps *C. hirsutus*) has been supposed to be *C. farinosus*, Linn.; but as Dr Lindley justly observes, this is a Madeira plant, and has probably nothing to do with producing Scammony.

The root-stock of the *Scammony Convolvulus* is imported in the dried state from Syria. It resembles Jalap root somewhat in its cathartic action. The roots are "tap shaped, sometimes three inches in diameter at the top, brown without, white within," with a slight odour, but no taste. The powder agitated with Ether, yields Scammony resin, which is obtained on evaporation. This root is chiefly employed as a means of obtaining by a chemical process a resin which is purer and more reliable than that imported in an impure state as *Scammony.*

Scammony is the juice of the fresh root obtained by cutting the top obliquely off, and allowing the milky juice which exudes to be collected in shells or other vessels placed at the lowest part. The whole collected is allowed to dry in any convenient receptacle, and constitutes what is called *Virgin Scammony*, but this is very seldom to be met with in so pure a state. The greater part of that met with in English commerce is imported from Smyrna. An account of the collection of Scammony was given by Mr Maltass, an inhabitant of Smyrna, in the Pharm. Journ. xiii. 267. A more recent description has been obtained from M. Boulin, Gazette Médicale d'Alger, 1859. It is obtained in a large district round Smyrna, extending as far as Adalia on the south, and Mount Olympus on the north. Much is collected in the district of the Meander, but most in the plain of Mysia. The best is obtained from the Greek peasants, who take more trouble than the Turks do in preserving the product from dust, mixture with particles of root, &c. Various amounts of chalky earth are mixed in by the peasants before drying. Water is often added. The Turkish collectors mix up with their Scammony a decoction of the roots of the plant. An inferior kind of Scammony is sent from Angora to Constantinople, and largely exported to Austria. The good Scammony brought to Smyrna does not exceed 7 cwt. yearly. The inferior kinds, which chiefly supply the market, are prepared at that place by melting together good Scammony, Angora Scammony, Wheat-Starch, Earth, Gum, &c., with water, into a homogeneous mass, which is then kneaded with the hands, and made into flattened cakes, or packed in drums.

Scammony is usually in shapeless lumps, rubbed and of a dull ash-grey colour externally; the fracture is conchoidal, and, when it is fresh, displays a glistening resinous lustre, of a pale, soon passing to a dark greenish-black colour, something like Guaiacum; a small splinter is grey and somewhat transparent; Sp. Gr. 1·2; the whole is brittle, easily pulverised; and the powder of an ashy-grey colour. The odour is faint, but peculiar, more perceptible if breathed upon, sometimes compared with that of old cheese; taste slight, but acrid. It should burn away without leaving much ash; form an emulsion with water, and dissolve almost entirely in boiling Alcohol, while Ether will take up from 75 to 82 parts of Resin. Dr Christison gives as the constituents of two distinct specimens of old Scammony, Resin 81·8 and 83·0, Gum 6·0 and 8·0, Starch 1·0 and 0·0, Fibre and Sand 3·5 and 3·2, Water 7·7 and 7·2. Hence it is a gum-resin, with only a small proportion of Gum.

The Resin has a feeble Scammony odour and taste, and a dirty greenish-brown colour; but when purified, it is of a pale wine-yellow colour, and is free from both taste and smell. Its powder forms with milk a fine uniform emulsion. It is soluble in Ether. This resin may be distinguished from Scammony by not forming a white emulsion when rubbed with the wet finger.

The less pure kinds of Scammony, which are also the more common, and enumerated by Dr Pereira as the *seconds* and *thirds* of commerce, are distinguished by their greater weight, less resinous, rather dull fracture; by their greyish, sometimes blackish colour, frequently with glimmering or whitish spots; also by their form, being sometimes that of the vessel in which they have been packed, sometimes in flattish cakes, at other times in amorphous spongiform masses. Some effervesce with H Cl from being adulterated with Chalk; others, from containing Starch, are affected by Tincture of Iodine. (*See* Tests.)

Tests.—While yet in a soft state, it is said to have often mixed with it the expressed juice of the stalks and leaves, also flour, ashes, and sand. Dr Pereira enumerates chalk, amylaceous matter, sand, and guaiacum as impurities; and tragacanth has been found in some specimens. It should be tested for chalk with H Cl, for starch with Iodine. Ether should dissolve from 80–90 per cent. Some of the masses appear to have been rolled in chalk, but do not contain any in their substance. Guaiacum may be detected by the action of Nitrous gas, and sand and chalk are found in the ashes after incineration.

Action. Uses.—A Drastic Cathartic. Useful on account of the small doses in which it can be prescribed; as for an adult, gr. x.–gr. xv.; but if pure or Virgin Scammony be used, gr. v.–gr. x. will suffice. It is usually given in combination with Rhubarb or Calomel, or in the following preparations; sometimes in biscuits.

Pharm. Prep.—Ext. Colocynth. Comp. Pil. Colocynth. Comp. Pil. Coloc. et Hyoscyam.

Pulvis Scammonii Compositus, B. Comp. Scammony Powder.

Prep.—B. Rub up separately into very fine powder *Scammony* ℥iv. *Jalap*, ℥iij., *Ginger* ℥j. Mix thoroughly, pass through a fine sieve, and finally rub lightly in a mortar.

Action. Uses.—Cathartic. May be given in doses of gr. x.–gr. xxx.

Confectio Scammonii, B. Scammony Confection.

Prep.—B. Take of *Scammony*, in fine powder, ℥iij.; *Ginger*, in fine powder, ℥jß; *Oil of Caraway*, fʒj.; *Oil of Cloves*, fʒß; *Syrup*, f℥iij.; *Clarified Honey*, ℥jß. Rub the powders with the Syrup and the Honey into a uniform mass, then add the Oils, and mix.

Action. Uses.—Stimulating Cathartic in doses of gr. x.–xxx.

Resina Scammoniæ, B. Resin of Scammony.

Prep.—B. Take of *Scammony Root*, in coarse powder, ℥viij.; *Rectified Spirit*, a sufficiency; *Distilled water*, a sufficiency. Macerate the Scammony Root with sixteen fluid ounces of the Spirit in a covered vessel, at a gentle heat, for twenty-four hours; then transfer to a percolator, and, when the tincture ceases to pass, pour into the percolator successive portions of Spirit until the root is exhausted. Add to the tincture four fluid ounces of the Water, and distil off the spirit by a water bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin, wash this two or three times with hot water, and dry it on a porcelain plate by a stove or water bath. (It may also be prepared in a similar way from *Scammony.*)

The mode of preparation is the same as that of the Resin of Jalap, and the result is a product in every way superior to commercial Scammony, and more certain in its action. Dr Williamson, of London, took out a patent in July 1856, for a mode of obtaining the resin by causing the vapour of alcohol to act upon the powdered root. This resin may be distinguished from that of Jalap by its solubility in ether. (M. Kosmann finds *Scammonin* to have the composition ($C_{64}\,H_{52}\,O_{32}$). He considers it to be a compound of Glucose ($C_{12}\,H_{12}\,O_{12}$) and *Scammoniol* ($C_{28}\,H_{26}\,O_{6}$).

Action. Uses.—Active Cathartic in doses of gr. v.–gr. x. with some bland fluid, such as milk. Good Scammony contains at least 80 per cent. of this Resin. Mr Bell finds that Alcohol dissolves 80 grains (resin), and proof Spirit 90 (resin and watery extractive), out of 100 gr. of a good sample of Scammony.

The Resin of Scammony is sometimes adulterated with the cheaper Resins of Guaiacum, Jalap, and Colophony. Resin of Jalap is recognised by its insolubility in pure ether. Resin of Guaiacum may be detected by turning blue with Nitrous acid gas. Colophony may be dissolved out by Oil of Turpentine, or discovered by the deep red colour produced on trituration with strong Sulph. acid. (Thorel.) The solution of Scammony resin in an alkali, like that of Jalap resin, should give no precipitate on the addition of $S\,O_3$.

MISTURA SCAMMONII, B. Scammony Emulsion.

Prep.—Take of *Resin of Scammony* gr. iv., *Milk* ℥ij. Triturate the Resin of Scammony with a little of the Milk, and continue the trituration, gradually adding the remainder of the milk, until a uniform emulsion is obtained.

Action. Uses.—Cathartic Emulsion, without any disagreeable taste. ℥ß–℥ij., for a child.

LABIATÆ, *Juss.* Labiates.

The Labiatæ are most clearly allied to *Verbenaceæ* and to *Boragineæ*, more remotely to *Scrophularineæ*. They are found in most parts, but more numerously in the Old than in the New World, and most abundantly in temperate climates. They abound in volatile oil, usually containing Stearoptene, often also a little bitter and astringent principle.

Tribe *Menthoideæ*. Corolla nearly regular. Stamens distant, straight.

LAVANDULA. Lavandula vera, *Dec.* Flowering Heads. Common Lavender.

It is unknown when Lavender was first employed in medicine.

LAVANDULA VERA forms a branched shrub, about 4 feet high. Leaves oblong, linear or lanceolate, entire, when young hoary, revolute at the edges. Spikes interrupted. Whorls of 6 to 10 flowers. Floral-leaves rhomboid-ovate, acuminate, membranous, all fertile, the uppermost shorter than the calyx. Bracts scarcely any. Flowers purplish-grey. Calyx tubular, nearly equal, shortly 5-toothed, 13 or rarely 15-ribbed. Corol, upper lip 2-lobed, lower 3-lobed; all the divisions nearly equal; the throat somewhat dilated. Stamens didynamous, declinate. Filaments smooth, distinct, not toothed. Anthers reniform, 1-celled. Ovary and fruit as in the order.—A native of barren hills in Europe, extending to the north of Africa. Cultivated in gardens; extensively at Mitcham, in Surrey, and at Hitchin in Herts, where 35 acres are now under cultivation with lavender. Tops collected in June and July.—Esenb. and Eberm. t. 178.

LAVANDULA SPICA, *Dec.* French Lavender, sometimes called *L. latifolia*, is a distinct species from *L. vera*, but indigenous in the same countries. It may easily be distinguished by its leaves being broader and somewhat obovate or spathulate. Its odour is not so agreeable as that of common Lavender, though more powerful.—Esenb. and Eberm, 179, as *L. latifolia*.

Lavender flowers, or rather tops, as usually dried, are well known by their spike-like appearance, greyish *lavender* colour, grateful fragrant odour, and warm bitterish taste. The properties depend chiefly on the presence of Volatile Oil.

Action. Uses.—Stimulant, Carminative. The flowers are not officinal in the B. P.

Oleum Lavandulæ, B. English Oil of Lavender.

Prepared from Lavender Flowers distilled with water, as other volatile oils.

This Oil is of a light yellow colour, has a very grateful odour, and a pungent taste. Sp. Gr. 0·87 to 0·94. It consists of a fluid volatile oil, holding in solution a camphor-like substance, which has been called *Stearoptene*. It is soluble in rectified Spirit, and in two parts of proof Spirit. Like several other volatile oils, it will absorb Oxygen, and become acid. This Oil is apt to be mixed with the Oil of French Lavender, commonly called *Oil of Spike*, which is a powerful but less agreeable oil.

Action. Uses.—Stimulant, Carminative, in doses of ♏v.–♏x.

Spiritus Lavandulæ, B. Spirit of Lavender.

Prep.—Dissolve *Oil of Lavender* ℥j. in *Rectified Spirit* ℥xlix. (One-fifth the strength of Sp. of B. P. 1864.)

Action. Uses.—Prepared by dissolving the Oil in rectified Spirit. It may be also made by distilling the flowers with spirit. It approaches in nature the so-called *Lavender Water* of the shops, which contains also other volatile oils dissolved in Spirit.

Tinctura Lavandulæ Composita, B. Compound Tincture of Lavender. *Lavender Drops.*

Prep.—B. Macerate for seven days bruised *Cinnamon* and bruised *Nutmeg* āā gr. cl., *Red Sandal Wood* gr. ccc. in *Rect. Spirit* Oij. Then press and strain; and dissolve in the Tincture *Oil of Lavender* f℥jß, and *Oil of Rosemary* ♏x. Add rect. Spirit to make Oij.

Action. Uses.—This compound Tincture (same as that of the L. P.) contains the Volatile Oil of Lavender, and that of the other aromatics used, dissolved in Spirit and coloured by the Red Sandal Wood. It is Stimulant and Cordial; is used in Hysterical cases and in Flatulent Colic, in doses of ♏xv.–f℥ij. Used to make Liquor Arsenicalis.

MENTHA, *Linn.* Mint.

Calyx nearly equal, 5-toothed. Corol with the tube enclosed; limb nearly equal, 4-cleft, the upper segment broader. Stamens 4, equal; anthers with 2 parallel cells. Stigmas at the points of the bifid style. Fruit dry, smooth.

Several of the Mints, remarkable for their odour and taste, have long been used in medicine (Μίνθα, Ἡδὺοσμὸς, and Καλὰ μίνθα of the Greeks, *nana* of the Arabs), and some as sweet herbs; but it is difficult to distinguish one species from another by the short descriptions given.

Mentha Viridis, *Linn.* Spearmint.

Spearmint has long been employed in medicine.

Root creeping. Stem smooth, erect. Leaves sessile, lanceolate, acute, unequally serrated, glabrous, glandular below, those under the flowers bractlike; these and the calyxes hairy or smooth. Spikes linear-cylindrical; bracts subulate. Whorls approximated, or the lowest or all of them distant. Corol glabrous. Stamens rather long.—Marshy places in the milder parts of Europe, introduced into many parts of the world. Collected when about to flower.—E. B. 2424; Esemb. and Eberm. 166.

This plant has an agreeable odour, and a pleasant aromatic taste, with some bitterness.

Action. Uses.—Stimulant and Carminative.

Oleum Menthæ viridis, B. (English) Oil of Spearmint.

Prep.—Distil the flowering herb with Aq. as for other volatile oils.

Action. Uses.—Pale yellow in colour, becoming reddish by age, of a strong, rather grateful odour, and pungent taste, followed by a sensation of coolness, giving its properties to the plant (of which it forms about 1·500th part), and also to the preparations. Stimulant Carminative, in doses of ♏ij.–♏x.

Aqua Menthæ viridis, B. Spearmint Water.

Prep.—B. *English Oil of Spearmint* ʒjß, *Water* Cjß. Distil Cj.

Action. Uses.—Carminative, and used as a vehicle in doses of f℥jß.

Mentha piperita, *Linn.* Peppermint.

Peppermint seems to have been introduced into practice in this country in the last century.

Root creeping. Stem procumbent, ascending, smooth, or with a very few spreading hairs. Leaves stalked, ovate, lanceolate, acute, rounded at the base, smooth, serrated, floral leaves smaller, lanceolate. Spikes lax, the uppermost whorls collected into a short obtuse spike, the lower ones removed from each other. Calyx tubular, glabrous below, with lanceolate subulate teeth.—Watery places in England, and also in other parts of Europe.—Cultivated at Mitcham, and collected when the flowers begin to blow. Flowers from July to September.—Esemb. and Eberm. 165; E. B. 687; St. and Ch. 45.

Peppermint is remarkable for its diffusive aromatic odour, and its warm but agreeable taste, feeling at first warm, but afterwards cool. Its properties depend on a Volatile Oil, a Bitter principle, and some Tannin; these are taken up by Spirit, and to some extent by water. It may be prescribed in the form of its Oil or Spirit, or in its distilled Water, or Infusion.

Action. Uses.—Stimulant, Carminative. Much used in Flatulent Colic, &c., or where a diffusible Stimulant is indicated; or a medium required to counteract nausea or griping; or to cover the taste of other Medicines.

Oleum Menthæ Piperitæ, B. (English) Oil of Peppermint.

Prep.—Distil the fresh flowering herb with water, as above.

Peppermint Oil, obtained in the proportion of about a 200th part, is at first colourless, but soon becomes of a pale greenish-yellow colour, and of a deeper colour with age, has a fragrant penetrating odour, and a pungent but cooling taste. Sp. Gr. 0·902. Boils at

365°. At a temperature of – 12°, or by spontaneous evaporation, or pressure, white needle-like crystals of Stearoptene are obtained. From some kinds of oil from North America and from Canton, this Stearoptene separates spontaneously. This Oil is said to be composed of $C_{12} H_{10} O$, and its Stearoptene of $C_{10} H_{10} O$. According to Walter, these numbers should be doubled.

Action. Uses.—Stimulant, Carminative, in doses of ♏ij.–♏v. on a piece of Sugar.

AQUA MENTHÆ PIPERITÆ, B. Peppermint Water.

Prep.—B. *English Oil of Peppermint* ʒjß, *Water* Cjß. Distil Cj.

Action. Uses.—Carminative. Much used as a vehicle for other medicines in doses of f℥j.–f℥iij. Used in Mist. Ferri Aromatica.

SPIRITUS MENTHÆ PIPERITÆ, B. Spirit of Peppermint.

Prep.—B. As *Spir. Lavandulæ.* (One-fifth the strength of B. 1864, but 9 times as strong as the L. Spirit.)

Action. Uses.—Stimulant in doses of ʒß.–ʒj.

ESSENTIA MENTHÆ PIPERITÆ, B. Essence of Peppermint.

Prep.—Take of *Oil of Peppermint* f℥j., *Rectified Spirit* f℥iv.; mix, a stronger preparation: 1 part in 5, instead of 1 in 50.

Dose.—♏x.–♏xx.

[MENTHA PULEGIUM. *Linn.* L. Pennyroyal.

Supposed to have been the Γλήχων of the Greeks, and the Pulegium of Pliny.

Creeping root. Stem much branched, prostrate, rooting. Leaves about half an inch long, stalked, ovate, or elliptical, crenate, upper ones smaller, all with pellucid dots, a little hairy. Whorls sessile, all remote, globose, many-flowered. Calyx hispid, tubular, bilabiate, villous in the inside of the throat. Corols of a light purple.—Wet places in many parts of Europe. Collected when beginning to flower.—E. B. 1026; Esemb. and Eberm. 167; St. and Ch. i. 45.

The whole herb has a powerful fragrant odour, and warm, aromatic, as well as bitter taste. Its properties depend on Volatile Oil and Tannin, and are very similar to those of other species of Mint.

OLEUM MENTHÆ PULEGII, L. Oil of Pennyroyal.

Obtained by distilling the herb with water.

Action. Uses.—Stimulant, Carminative, in doses of ♏ij.–♏v.

AQUA PULEGII, L.

Prep.—As Aq. Menth. Pip.

Action. Uses.—These preparations are applicable to the same purposes and in the same doses as the preparations of Mint and of Peppermint.]

Tribe *Monardeæ*. Corolla 2-lipped. Stamens 2, fertile, parallel under the upper lip.

The tribe *Monardeæ* contains SALVIA OFFICINALIS, *Linn.*, or Garden Sage, which has been employed in medicine from the times of the Greeks, and is no doubt as useful as other Labiatæ for many of the same purposes. It is pungent and aromatic, and its Oil contains Stearoptene, while the plant abounds also in Bitter principle.

ROSMARINUS OFFICINALIS, *Linn.* Common Rosemary. *Diandria Monog.* Linn.

Rosemary was called *Libanotis coronaria*, which the Arabs translated *akleel-al-jibbul*, or the Mountain Crown.

A very leafy shrub, 5–6 feet high. Leaves sessile, elongated, narrow, revolute at the margin, hoary beneath. Flowers few, in short, axillary, subsessile, opposite racemes, forming altogether a kind of spike. Floral leaves shorter than the purplish calyx, which is 2-lipped, the upper entire, the lower bifid. Corol of a greyish-blue or lavender-colour, not ringed in the inside, somewhat inflated in the throat, upper lip emarginate, the lower trifid, with the middle lobe larger, concave, and hanging down. Filaments shortly toothed near the base; anthers linear, with two divaricating confluent cells. Upper lobe of style very short.—Rocky hills of the south of Europe, Asia Minor, and Syria.—Flora Græca, t. 14; St. and Ch. i. 24.

Rosemary tops should be collected when coming into flower. They have a powerful odour, a warm and bitter, slightly astringent taste. Their properties depend on Volatile Oil, Bitter principle, and Tannin.

Action. Uses.—Stimulant, Carminative. Supposed to be useful in preserving the hair. Much employed as an ingredient in some perfumes, as Hungary Water and Eau de Cologne. "The admired flavour of Narbonne Honey is ascribed to the bees feeding on the flowers of this plant." *Lindl.*

OLEUM ROSMARINI, B. Oil of Rosemary.

Distil the flowering tops with water.

The Oil of Rosemary is obtained in the proportion of 4 or 5 ounces from a cwt. of the herb: sometimes scarcely any is yielded. (P. J. ii. 516.) It is colourless, having all the properties of the plant. Sp. Gr. 0·88. The imported Oil is usually very impure. The English Oil (specified in B. 1864) is scarce.

Action. Uses.—Stimulant, chiefly applied externally, and used as an ingredient of perfumes. Used in Tinct. Lavandulæ Co. and Linim. Saponis.

SPIRITUS ROSMARINI, B. Spirit of Rosemary.

Prep.—As *Spiritus Lavandulæ*. One-fifth the strength of B. 1864, but contains 13 times as much Oil as the L. prep.

Action. Uses.—Stimulant Spirit. Often employed to impart an agreeable odour to Lotions.

Tribe *Satureineæ.* Corolla 2-lipped. Stamens 4, distant. Anther-cells separate, divergent.

ORIGANUM VULGARE. Common Marjoram.

The ὀρίγανος of the Greeks and *satar* of the Arabs is supposed to be this plant.

Root creeping. Stem erect, 1–2 feet high. Leaves stalked, broad, ovate, obtuse, often slightly serrate. Spikes oblong, 4-sided, imbricated, with bracts, clustered in corymbose panicles. Bracts ovate, obtuse, coloured, longer than the calyx, which has 5 equal teeth, and is 10–13 nerved, throat hairy. Corol, upper lip straight, nearly flat; lower spreading, 3-fid. Stamens divergent, connective subtriangular. Achænia rather smooth.—Europe, the Mediterranean region, and extending to the Himalayas.—E. B. 1143; St. and Ch. 131.

ORIGANUM MARJORANA, *Linn.*, now MARJORANA HORTENSIS, *Mœnch.*, is the *Sweet Marjoram* of the gardens. Native of the south of Europe and Syria.

Wild Marjoram has a strong but rather agreeable odour, and a bitter aromatic taste, which it retains in its dry state. Its properties depend chiefly on its Volatile Oil. It is no longer officinal.

Action. Uses.—Stimulant, Carminative. May be used in Infusion.

OLEUM ORIGANI. Oil of Marjoram; called *Oil of Thyme.*

Distil the herb with water. A reddish oil is obtained, which becomes colourless on redistillation.

Action. Uses.—Stimulant in doses of ♏v.–♏x. Chiefly used externally, with Olive Oil, &c., as a remedy for toothache.

Mr D. Hanbury has shown that the *Ol. Origani* of English druggists is not only called so, but is in fact *Oil of Thyme*, being distilled in large quantities from the *Thymus vulgaris* in the department of the Gard, in the south of France.

This true *Oleum Thymi* consists of a peculiar Stearoptene, *Thymol*, and a volatile substance, *Thymene*, isomeric with Oil of Turpentine. (*Lallemand.*)

Tribe *Melissineæ.* Corol 2-lipped. Stamens distant. Anther-cells connected above.

MELISSA OFFICINALIS, *Linn.* Common Balm.

This plant is supposed to be the Μελισσόφυλλον of Dioscorides.

Stem branched, 1–2 feet high. Leaves ovate, acute, cordate at base, crenate. Flowers white, in axillary unilateral racemes. Calyx 13-nerved, subcampanulate, slightly ventricose in front, 2-lipped, upper lip flat, truncate, with 3 short broad teeth, lower with 2 lanceolate teeth. Corol, upper lip concave, lower spreading, trifid, with apices of stamens connivent under the upper lip of the corol. Anther-cells divergent.—South of Europe; cultivated in English gardens. —Esenb. and Eberm. 180.

Balm has an agreeable odour, like that of the Citron, and a mild aromatic taste, with a little astringency, its properties depending, as in the other Labiatæ, on Volatile Oil, Bitter principle, and Tannin. It is not now officinal.

Action. Uses.—Mild Stimulant. Much used on the Continent in the slighter Nervous affections, generally in the form of Infusion (ʒiv.–Aq. Oj.) or *Balm Tea.*

Tribe *Stachydeæ*. Stamens approximating, parallel under the upper lip of the corol, 2 inferior largest. Calyx tubular or bell-shaped, spreading in front.

The common White Horehound, *Marrubium vulgare*, is much used in popular medicine as an aromatic tonic, in coughs, &c., but is not officinal.

SCROPHULARINEÆ. *Brown.* Figworts.

They are allied on one side to Labiatæ, on the other to Solanaceæ. They are found in all parts of the world. Some are acrid, but the majority have few active properties. To this Digitalis is an exception. The indigenous *Scrophularia nodosa*, which is slightly acrid, is sometimes made use of in the form of ointment as an application to indolent tumours and sores.

DIGITALIS, B. Digitalis purpurea, *Linn.* Purple Foxglove. The dried leaf. (From wild indigenous plants, gathered when about two-thirds of the flowers are expanded.)

Foxglove does not appear to have been known to the ancients. Fuchsius was the first to describe it, and to name it Digitalis, from the resemblance of its flowers to the finger of a glove. It was admitted into the L. P. of 1668 and 1721, rejected in that of 1745. Withering brought it into permanent notice in 1775.

Biennial. Root fibrous. In the first year a tuft of radical leaves is thrown up, from the midst of which rises, in the second year, a stem 1-5 feet high, which is erect, wand-like, and leafy, slightly angled and downy, in some varieties with a purple tinge, as well as on the lower surface of the leaves. Leaves alternate, ovate-lanceolate, or oblong, crenate, and rugose, downy, especially on the under surface, tapering at the base into winged footstalks. Racemes terminal, long, and lax, on which the pendulous flowers appear on one side in slow succession. Flowers crimson, purple, marked with eye-like spots, and hairy within; sometimes white. Calyx 5-parted, segments ovate, or oblong-acute. Corol declinate, much longer than the calyx, contracted at the base, campanulate and ventricose above, with an oblique limb; upper limb emarginate, lower 3-fid, with the middle lobe the largest, all short, obtuse. Stamens 4, didynamous, ascending; anthers smooth. Stigma bilamellate. Capsule ovate-acute, with a septicidal dehiscence. Seeds very small, of a pale brownish colour, and pitted.—Indigenous, and also common chiefly in the western parts of the Continent: found on pastures and exposed hill sides, as well as in plantations; begins to flower in June and July, and ripens its seed in August and September.—Nees von E. 154; St. and Ch. i. 18.

The leaves only are officinal. The roots, collected in the autumn or winter of their first year, are possessed of active properties; so also are the seeds. The leaves of this plant, like the leaves of all biennial plants, Dr Houlton says, should be gathered in the second year of their duration, and as soon as possible after the first flowers have expanded: he also prefers those plants which have a purplish stem. Dr Christison, however, thinks this a needless restriction. He has observed that their bitterness, which probably measures their activity, is very intense both in February and September, and that their extract is highly energetic as a poison in the middle of April, before any appearance of the flowering stem. The proportion of solid matter in the leaves is larger in summer than in spring. Von Hees found the amount of dry leaf yielded by the fresh leaf in May to be 15·8 per cent.; in July, 17·4 per cent. Full-grown and perfect

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leaves should be chosen, especially of such plants as grow spontaneously in open situations. They are to be gathered before the terminal flowers have expanded. They should be carefully dried in a dark airy room, the midrib and petiole being first separated, and kept so that the light be excluded. They should be renewed annually, have a dull, but when powdered, a fine green colour, a slight odour, with the strong bitterness of the recent plant. The juice of the fresh plant may be expressed and evaporated to the consistence of an extract, or its active properties imparted to water or Spirit. The leaves of Digitalis have been found to contain traces of Volatile Oil, Fixed Fatty matter, a red Colouring matter, Chlorophylle, Albumen, Starch, Sugar, Gum, salts of Potash, Lime, and of Magnesia, an acid, partly free and partly combined, and a peculiar Bitter principle (*Digitalinum*), on which the activity of the plant depends. (*Homolle.*) This Bitter matter is soluble in Alcohol, a little so in Ether, and dissolves in water with the aid of the substances with which it is combined and mixed. Perchloride of Iron produces a greenish-black, and Tincture of Gall-nuts a greyish precipitate. It was by means of Tannin and Oxide of Lead that M. Homolle first, and subsequently M. Henry, succeeded in isolating Digitalin.

Dr Morries Sterling, by the destructive distillation of the dried leaves of Foxglove, obtained an empyreumatic oil, containing a crystalline principle possessed of narcotic properties.

The leaves of Foxglove are apt to be intermixed with those of *Verbascum Thapsus*, also with those of *Symphytum officinale*, and sometimes with those of *Conyza squarrosa*, but they may be distinguished by attending to the description, or by comparison with genuine leaves.

The leaf of Foxglove is "ovate lanceolate, shortly petiolate, rugose, downy, pale on the under surface, crenate." B. P.

Action. Uses.—Sedative, that is, first somewhat exciting and then greatly diminishing the force and frequency of the heart's action. The intestinal canal is apt to be disordered by large doses, as well as the brain and organs of the senses affected by vertigo, &c. The kidneys are often acted on, and the secretion of urine increased. It is cumulative in its effects; therefore when nausea or intermission of the pulse occurs, its use should be discontinued for a time, and the patient should not rise from the recumbent position when under its influence. It has been used to control the circulation, in Diseases of the Heart, in Fever, in Inflammations, and in Pulmonary affections after the acute symptoms have subsided, and is useful in excitement from nervous irritability. It is much prescribed as a Diuretic in Dropsies of all kinds, but is most useful in those associated with a debilitated and generally diseased state of the constitution.

Dose.—Of the powder to act as a Sedative, gr. j.–gr. jß should be given 5 or 6 times a-day, carefully watching its effects. As a Diuretic, gr. j.–gr. iij. 3 times a-day, usually with some aromatic; but those containing Tannin may precipitate its active principle.

Antidotes.—In cases of poisoning, or of excessive doses, evacuate the stomach, and assist the vomiting with diluents; prescribe astringents containing Tannin, as Infusion of Nut-galls, of Oak-bark, of Green Tea; preserve the recumbent position; administer Ammonia, Wine, Brandy, Aromatics.

INFUSUM DIGITALIS, B. Infusion of Foxglove.

Prep.—B. In a covered vessel infuse for one hour dried *Digitalis* gr. xxx. in boiling *Aq. dest.* Oß. Strain.

Action. Uses.—An effective preparation in doses of fʒiv.–f℥j. every 3 or 6 hours.

TINCTURA DIGITALIS, B. Tincture of Foxglove.

Prep.—B. *Digitalis*, in coarse powder, ℥ijß, *Proof Spirit* Oj. Prep. as Tinct Aconiti.

Action. Uses.—Sedative, Diuretic, in doses of ♏x.–♏xl. gradually increased. Much larger doses (up to ℥ß) have been recommended and given lately in Delirium tremens and other disorders, but their use is not unattended with danger.

LINIMENTUM DIGITALIS.—The Diuretic effects of Digitalis may be often secured by rubbing the Tincture with Soap Liniment on the abdomen. Or make a Liniment with *Inf. Digitalis* f℥ij., *Liq. Ammoniæ* fʒij., *Ol. Papaverum* ʒiv., to be used 2 or 3 times a-day, diluting it if necessary.

DIGITALINUM, B. Digitalin. The active principle of Digitalis.

The active bitter principle of Digitalis, which was first obtained by M. Homolle, is a very powerful poison, causing death by syncope. In minute quantities it produces the medicinal effect of Foxglove, and as it does not vary in strength, is by some preferred to the raw leaf as a remedial agent. A formula for its preparation, similar to that adopted by M. Homolle, has been introduced into the B. P. The Digitalis is dissolved out of the spirituous extract by Acetic acid, precipitated by Tannin, and finally separated from the latter by Oxide of Lead.

Prep.—B. Take of *Digitalis Leaf*, in coarse powder, ℥xl; *Rectified Spirit, Distilled water, Acetic acid, Purified Animal Charcoal, Solution of Ammonia, Tannic acid, Oxide of Lead* in fine powder, *Pure Ether*, of each a sufficiency. Digest the Digitalis with Cj. of the Spirit, for twenty-four hours, at a temperature of 120°, then put them into a percolator, and when the tincture has ceased to drop, pour Cj. of Spirit on the contents of the percolator, and allow it slowly to percolate through. Distil off the greater part of the Spirit from the tincture, and evaporate the remainder over a water bath until the whole of the Alcohol has been dissipated. Mix the residual extract with ℥v. of Distilled water, to which ʒß of Acetic acid has been previously added, and digest the solution thus formed with a ℥¼ of purified Animal Charcoal, then filter and dilute the filtrate with Distilled water until it measures Oj. Add solution of Ammonia nearly to neutralisation, and afterwards add clx. gr. of Tannic acid dissolved in ℥iij. of Distilled water. Wash the precipitate that will be formed with a little Distilled water; mix it with a small quantity of the Spirit and a ℥¼ of the Oxide of Lead, and rub them together in a mortar. Place the mixture in a flask, and add to it ℥iv. of the Spirit; raise the temperature to 160°, and keep it at this heat for about an hour; then add a ℥¼ of purified Animal Charcoal; put it on a filter, and from the filtrate carefully drive off the Spirit by the heat of a water bath. Lastly, wash the residue repeatedly with pure Ether.

The digestion is conducted at a temperature of 120°, that the Spirit may not be lost by evaporation. The Spirit is then distilled off till an extract is left. This contains the Digitalin and other parts of the leaf soluble in spirit. Acted on by dilute Acetic acid, the Digitalin, with some colouring matter, &c., is dissolved, the oily and resinous principles being left behind. Part of the colouring matter is now removed by Animal Charcoal. The Acetic acid is nearly neutralised with Ammonia, and a solution of Tannic acid added, which throws down an insoluble Tannate of Digitalin. This is digested with Spirit and Litharge. The Tannic acid unites with the latter, forming an insoluble Tannate of Lead. The Digitalin dissolves in the spirit. It is again digested with Animal Charcoal, the spirit distilled off, and the powder which remains is washed in Ether, to free it from any residue of impurity.

M. Lebourdais has prepared this alkaloid by shaking up the infusion of Foxglove with a considerable quantity of Animal Charcoal. The latter removes the whole from the fluid. It is separated, washed, and boiled in alcohol. When this is evaporated to a certain bulk, a pulverulent matter subsides; which, being washed, redissolved in alcohol, and this allowed to evaporate spontaneously, forms crystals of Digitalin.

Digitalin, thus prepared, is not crystalline, but in white porous mammillated masses or scales, inodorous, intensely bitter. Very soluble in spirit, almost insoluble in water and ether. It has no alkaline reaction; it dissolves in acids, but does not form neutral salts with them. It is thus regarded as a neutral principle rather than an alkaloid, being called *Digitalin*, and not, as formerly, *Digitalia*. When Digitalin is moistened with strong $S\ O_3$ a beautiful, but evanescent purple colour is produced (Lebourdais). Its solution in $H\ Cl$ is of a faint yellow colour, but rapidly becomes green. (B.) It is precipitated by Tannic acid. Its bitterness and its irritating property are two important characters. Its powder powerfully irritates the nostrils. Digitalin, like other organic principles, should leave no residue when burned with free access of air.

There is some discrepancy of statement as to the exact composition and formula of Digitalin. There is some reason for believing it to be a compound body (*glucoside*). M. Kosmann states that anhydrous Digitalin has the composition ($C_{54}\,H_{45}\,O_{30}$), but readily attracts from the air 8 atoms of water, which are driven off at 212°. He has decomposed it into grape sugar and another alkaloid, Digitaleritin ($C_{30}\,H_{25}\,O_{10}$).

Action. Uses.—Digitalin may be given as diuretic and sedative in the same cases as Digitalis. As it is very poisonous, great care must be taken in prescribing it. It may be administered in solution in Acetic acid or in Alcohol.

Dose.—Gr. $\frac{1}{30}$–gr. $\frac{1}{10}$.

The leaves of the Mullein, *Verbascum Thapsus*, have been popularly employed as demulcent; and those of *Scrophularia nodosa* as rubefacient; but neither are officinal. Both belong to this order. (Some include *Verbascum* among Solaneæ.)

SOLANEÆ. *Jussieu.* Nightshades. *Pentand. Monog.* Linn.

The Solaneæ are allied to Convolvulaceæ, &c. They are with difficulty distinguished from some of the Scrophularineæ. (Verbascum.) The Solaneæ chiefly inhabit tropical regions, where many are shrubby and even arboreous; a few extend into the temperate and even cold climates of higher latitudes. Several of the species are remarkable for their narcotic properties.

DULCAMARA, B. Solanum Dulcamara, *Linn.* Bitter Sweet. Woody Nightshade. The young branches, dried. (From indigenous plants which have shed their leaves.)

Dulcamara is supposed to have been employed by the ancients, but has been distinctly known only since the time of Tragus.

Root woody. Stem shrubby, flexible, twining in hedges and over shrubs to the height of 12 or 15 feet. Leaves cordate-ovate, the upper ones more or less auriculate, halberd-shaped, all generally smooth, acute, and entire at the margin. Racemes spreading, cyme-like, opposite to the leaves, or terminal. Flowers drooping. Bracts minute. Calyx permanent, 5-parted. Corol rotate, 5-parted, purple—coloured with 2 green spots at the base of each segment. Anthers 5, yellow, erect, connivent, opening by 2 pores at the apex. Berry scarlet, ovoid, juicy, many-seeded.—Indigenous in woods and hedges throughout Europe; found also in Asia and America.—Nees von E. 188; St. and Ch. 17.

Solanum nigrum, a small leafy plant, with obtusely angled acute leaves, white rotate flowers, and berries about the size of peas, is said to have the same properties as the above; but it is also narcotic. Its leaves are sometimes sold for those of Belladonna. The twigs of the Potato (*Solanum tuberosum*), of which the tubers are so important on account of their starch, are also said to possess some of the same properties.

The officinal part is the stem and twigs, which should be collected in autumn, when bare of leaves, as directed by the B. P. They are about the thickness of a pen, usually cut into short pieces, sometimes split down the middle; and when dry, they are light, wrinkled, containing much pith, and of a greyish colour. In this state they are scentless, but have a bitter taste, followed by a slight degree of sweetness. It is probable that the root, leaves, and berries have the same properties, which are taken up both by water and Spirit. Analysed, the twigs have been found to contain an alkali, *Solanine* or *Solania*, Gum, Gluten, with Potash and Lime Salts. Pfaff indicated the presence of a bitter principle with a sweet after-taste, which he named *Dulcamarine.* (Pelletier considers this to be merely sugar combined with Solania.) *Solania*, when purified, is white, pearly, imperfectly crystalline. It restores the colour of Litmus reddened by an acid. Iodine and Iodide of Potassium produce a permanently dark and turbid brown colour with the solutions of Solania and its salts. It has a faint bitter taste; its salts scarcely crystallise; it does not dilate the pupil, but is said to be a powerful narcotic.

Action. Uses.—Alterative in Cutaneous diseases, &c., having a slight determination to the skin and kidneys; also slightly narcotic.

INFUSUM DULCAMARÆ, B. Infusion of Dulcamara.

Prep.—B. Infuse *Dulcamara* bruised, ℥j., in boiling *Dist. water*, ℥x., in a covered vessel for one hour, and strain. (A *decoction* was ordered in the L. P.)

Action. Uses.—Alterative, &c., in doses of f℥jß, 2 or 3 times a-day, with some aromatic water. It has been given in some skin diseases.

BELLADONNÆ FOLIA, B. Atropa Belladonna, *Linn.* The leaves, fresh and dried, and the fresh branches. (Indigenous.) Deadly Nightshade.

BELLADONNÆ RADIX, B. The root, dried.

This plant has been supposed to be the Mandragora of Theophrastus, and the *Strykhnos manicos* of Dioscorides; but it has been distinctly known only since the time of Tragus, and is said to have been first used in Germany as a cure for cancer.

Fig. 87.

This plant (fig. 87) has a lurid hue, and, when bruised, a fœtid odour. Root perennial, branched, but fleshy, white internally. Stems annual, herbaceous, 3-5 feet high, branched, round, slightly downy or velvety, with a tinge of red. Leaves with short footstalks, lateral, often in pairs of unequal size, broadly ovate-acute, entire, smooth and soft, 4 or 5 inches in length, often with hairs on under-surface. Flowers solitary, imperfectly axillary, stalked, about an inch in length, rather drooping. Calyx campanulate, 5-cleft. Corol (1) campanulate, an inch long, or twice the length of the calyx, greenish towards the base, but of a dark purple towards its 5-lobed equal border. Stamens 5, distant above. Style (2) as long as the corol. Stigma (3) capitate. Berry (4) seated in the enlarged calyx, globose, 2-celled, of a shining violet-black colour, about the size of a small cherry, with a longitudinal furrow on each side, 2-celled, containing numerous reniform seeds in a mawkishly sweet but neither agreeable nor nauseous pulp.—Indigenous in waste, often shady places, in many parts of Europe. Flowers in June and July, and its berries are ripe in September.—E. B 552; Nees von E. 191; St. and Ch. 1.

Belladonna is cultivated at Hitchin, where about 4 acres of land are set apart for it. The annual crop varies from 1-5 tons per acre. The plants are propagated by seed and by divisions of the roots. In the month of July in the second year, when in full flower and in greatest perfection, they are cut down and made at once into extract, as keeping injures them. The men engaged in the work are much affected in the eyes. (Bentley in P. J. n. s. vol. i. p. 515.)

The leaves are to be gathered from the wild or cultivated plant in Britain, along with the branches, when the fruit has begun to form. (B.) They are "alternate, 3–6 inches long, ovate, acute, entire, smooth, the uppermost in pairs and unequal."

The root of Belladonna, which is branched, thick, fleshy, 1–2 feet in length, 1–2 inches thick, is white internally when fresh, and becomes of a greyish colour when dried. The taste is slight, but bitter; the odour feeble, but its properties are energetic. It should be collected in autumn or spring. It is cultivated in England, but is mostly obtained from Germany, in the dried state. The leaves, when stripped from their stems and carefully dried, have a dull-green colour, very little odour, with a slightly bitter taste. Those of the wild plant are more esteemed than the leaves of cultivated Belladonna. The leaves of *Solanum nigrum*, as well as of *S. Dulcamara* (*see* p. 581), are sometimes sold by herbalists for those of Belladonna, and consequently may be employed medicinally by those who look for the powerful effects of this medicine, and who, being disappointed, will afterwards pronounce upon the inefficiency of the drug. The leaf of Belladonna is oval, acute, quite entire, glabrous, and has a disagreeable odour when bruised.

The leaves of Belladonna, analysed by Brandes, yielded Gum, Starch, Albumen, Chlorophylle, a little Wax, several Salts, Lignine, and water, with two nitrogeneous substances (Pseudo-toxine and Phytocolla), and an acid Malate of a powerfully poisonous principle, the alkaloid *Atropia*. The root contains this alkaloid in much larger quantity.

Action. Uses.—Anodyne, Antispasmodic; externally Anodyne, and used by surgeons for dilating the pupil. The roots possess the same properties as the leaves, and the berries have frequently proved poisonous to children. Dryness and stricture in the throat, difficulty of swallowing, nausea, &c., dimness of vision, dilatation of the pupil, vertigo, mirthful or extravagant delirium, followed by coma, are experienced. It sometimes induces sleep by relieving pain. Anodyne in Neuralgic and other pains; more applicable to those which are external than to internal pains. Antispasmodic in Hooping and other coughs. Thought by some to be Prophylactic against Scarlatina.

Dose.—Of the powder gr. j. of the leaves gradually increased to gr. v., or until dryness of the throat is experienced. Atropia $\frac{1}{10}$ of a grain produces all the same symptoms, and is preferred for dilating the pupil. The fixed alkalies are not to be prescribed with Belladonna. (*See* p. 592.)

EXTRACTUM BELLADONNÆ, B. Extract of Belladonna.

Prep.—B. From *fresh leaves* and *young branches of Belladonna.* Prepared like Extr. Aconiti.

Action. Uses.—The Extract of Belladonna is an uncertain preparation, because it is not always prepared with care. The B. P. directions, if carefully followed, are suited to insure a good preparation. Dr Christison suggests the preparation of an Alcoholic Extract.

Dose.—Gr. ß or gr. j., 2 or 3 times a-day, gradually increased to gr. v. until the peculiar effects of Belladonna are observed. It is often diluted with water and applied on the eyebrow, to dilate the pupil, or a solution dropped into the eye; or it may be applied externally as a liniment, or used endermically to relieve severe pains. It has also been applied to the os uteri in protracted first labours, and used in stricture of the urethra, and spasm of the sphincter ani, &c.

TINCTURA BELLADONNÆ, B. Tincture of Belladonna.

Prep.—B. *Belladonna leaves*, in coarse powder, ℥j.; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti. (Half as strong as Tinct. Belladonnæ, L.)

Action. Uses.—Anodyne.

Dose.—♏x.–♏xx.

EMPLASTRUM BELLADONNÆ, B. Belladonna Plaster.

Prep.—B. Take of *Extract of Belladonna*, *Resin Plaster*, of each, ℥iij.; *Rectified Spirit*, f℥vj. Rub the Extract and Spirit together in a mortar, and when the insoluble matter has subsided, decant the clear solution, remove the Spirit by distillation or evaporation, and mix the alcoholic extract thus obtained with the Resin Plaster melted by the heat of a water bath, continuing the heat until with constant stirring the plaster has acquired a suitable consistence. [This is a new formula. The plaster contains the Atropia, but not the parts of the extract insoluble in Spirit.]

UNGUENTUM BELLADONNÆ, B. Belladonna Ointment.

Prep.—Rub up *Ext. Belladonna*, gr. lxxx., with a few drops of *Dist. water*, then add *Prepared Lard* ℥j., and mix thoroughly.

Action. Uses.—Both used as Anodyne in Neuralgic and other pains. Belladonna may also be applied externally in the form of its Infusion, as a Lotion.

Antidotes.—Emetics and Purgatives, Astringent Infusions, application of cold to the head, and the use of the ordinary external stimuli; Ammonia internally in the Comatose state, as in Digitalis, p. 579.

ATROPIA, B. An alkaloid prepared from the root of Atropa Belladonna. *Atropine.*

This is the active alkali to which Belladonna owes its peculiar powers. It was discovered by Brandes in 1819. It was first introduced in the L. P. of 1851.

Prep.—B. Take of *Belladonna Root*, recently dried, and in coarse powder, ℔ij.; *Rectified Spirit*, Ox.; *Slaked Lime*, ℥j.; *Dilute Sulphuric acid*, a sufficiency; *Carbonate of Potash*, a sufficiency; *Chloroform*, f℥iij.; *Purified Animal Charcoal*, a sufficiency; *Distilled water*, f℥x. Macerate the Root in two quarts of the Spirit for twenty-four hours, with frequent stirring. Transfer to a displacement apparatus, and exhaust with the remainder of the Spirit by slow percolation. Add the Lime to the tincture placed in a bottle, and shake occasionally several times. Filter, add the Dilute Sulphuric acid in very feeble excess, and filter again. Distil off three-fourths of the Spirit, add to the residue the Distilled water, evaporate at a gentle heat, but as rapidly as possible, until the liquid is reduced to one-third of its volume and no longer smells of Alcohol; then let it cool. Add very cautiously, with constant stirring, a solution of the Carbonate of Potash so as nearly to neutralise the acid, care, however, being taken that an excess is not used. Set to rest for six hours, then filter, and add Carbonate of Potash in such quantity that the liquid shall acquire a decided alkaline reaction. Place it in a bottle with the Chloroform; mix well by frequently repeated brisk agitation, and pour the mixed liquids into a funnel furnished with a glass stopcock. When the Chloroform has subsided, draw it off by the stopcock, and distil it on a water bath from a retort connected with a condenser. Dissolve the residue in warm rectified Spirit; digest the solution with a little Animal Charcoal; filter, evaporate, and cool until colourless crystals are obtained.

This is the process of Mein, slightly modified. The Malate, or natural salt of Atropia, is extracted from the root by Alcohol. The lime decomposes it, and sets free the Atropia. The alkaloid is decomposed by heat, or by contact with water for any time. It is thus at once combined with Sulphuric acid, forming Sulphate of Atropia. The Carb. Potash, added *not* in excess to the aqueous solution of the Sulphate, precipitates a resin. This is separated by filtration. Carb. Potash, added now in excess, sets free the Atropia. The Chloroform dissolves it out of the liquid, and the alkaloid is finally purified by solution in Spirit, and digestion with Animal Charcoal. Mein obtained by his process (not using Chloroform) 20 gr. from 12 oz. of the root.

There are several other ways of preparing it.

[Bouchardat precipitates a watery infusion by means of Iodine. The "Ioduretted Iodide of Atropine" is then decomposed by Zinc and water. The Zinc being completely separated by adding Carb. Potash, the alkaloid is dissolved in Alcohol.

Mr Luxton obtains it by suspending a lump of Sesquicarb. Ammonia in a decoction of the *leaves* to which a small quantity of dil. SO_3 has been added before filtration. Crystals of Atropia slowly separate. They are washed with dilute liq. Ammoniæ, and dried. By this means it is said that from 5–6 gr. may be obtained from 1000 of the leaves.

Atropia may also be obtained by the charcoal-process applied by Lebourdais to the preparation of Digitaline (p. 580).]

The formula of Atropia, according to Planta, is the same as that of Daturia—$C_{34}H_{23}NO_6$. It crystallises in white, silky, transparent prisms, or in needles, like Sulp. Quinia. It has no odour, but a bitter and acrid taste. It is soluble in 200 parts of cold, 54 of hot water, and in 1½ of cold Alcohol; but requires 25 parts of ether to dissolve it. It reacts as an alkali. By heat it is first fused, then partly volatilised, partly decomposed. It combines with acids to form bitter soluble salts. With Nit. acid it forms a yellow solution; heated with Sulph. acid it becomes red (Pereira). Heated with Potash or Soda it is decomposed, evolving Ammonia. It is reddened by Iodine, and precipitated by Tannic acid. It produces a yellow crystalline precipitate with Perchloride of Gold, and a pulverulent one with the Chlorides of Platinum and Mercury. (Planta.)

Action. Uses.—Atropia possesses the properties of Belladonna in a high degree, being a powerful poison. It is thought dangerous for internal use, though it has been given in doses of gr. $\frac{1}{30}$–gr. $\frac{1}{10}$. But it is of use to surgeons, as preferable to Belladonna for producing dilatation of the pupil of the eye in cases of cataract, glaucoma, &c.

LIQUOR ATROPIÆ, B. Solution of Atropia.

Prep.—B. Take of *Atropia*, gr. iv.; *Rectified Spirit*, fʒj.; *Distilled water*, fʒvij. Dissolve the Atropia in the Spirit, and add the Water.

Action. Uses.—Contains 4 gr. of Atropia in the ounce, or about 1 part in 109½. 2–5 drops may be used to procure dilatation of the pupil.

UNGUENTUM ATROPIÆ, B. Ointment of Atropia.

Prep.—B. Take of *Atropia*, gr. viij.; *Rectified Spirit*, fʒß; *Prepared Lard*, ℥j. Dissolve the Atropia in the Spirit, add the Lard, and mix thoroughly.

Action. Uses.—About 8 gr. in the ounce. Twice as strong as the solution. 5–10 gr. rubbed on the temple or round the eye will produce dilatation of the pupil.

ATROPIÆ SULPHAS, B. Sulphate of Atropia.

Prep.—B. Take of *Atropia*, gr. cxx.; *Distilled water*, fʒiv.; *diluted Sulphuric acid*, a sufficiency. Mix the Atropia with the water, and add the Acid gradually, stirring them together until the alkaloid is dissolved and the solution is neutral. Evaporate it to dryness at a temperature not exceeding 100°.

From the L. P., restored in 1867. It is a powerful poison, intended for external use only.

This soluble salt is preferred by many to the simple alkaloid for the same purposes for which the latter is employed. It has the advantage of being more soluble in water, and less liable to decomposition. To cause dilatation of the pupil, a solution may be made as follows:—

LIQUOR ATROPIÆ SULPHATIS, B. Solution of Sulphate of Atropia.

Prep.—B. Take of *Sulphate of Atropia*, gr. iv.; *Distilled water*, f℥j. Dissolve.

Introduced in 1867. Preferred by some to Liq. Atropiæ.

Atropia is now commonly applied by ophthalmic surgeons in the form of tissue paper or tablets of gelatine. The paper or gelatine may be impregnated with Sulphate of Atropia in such a manner that a piece $\frac{1}{5}$th of an inch square will contain $\frac{1}{250}$ of a gr. of the salt, a square of $\frac{1}{10}$th of an inch the $\frac{1}{1000}$ of a gr. This minute square is introduced beneath the eyelid on the damped forefinger of the operator, and the eye kept closed by a bandage till the pupil is dilated. (*See* Lancet, Ophthalmic Review, Pharm. Journ. &c., 1862–4.)

Capsici Fructus, B. Capsicum fastigiatum, *Blume.* The ripe Fruit, dried. (From Zanzibar.) Capsicum. Chillies.

The several species of Capsicum are natives of South America, whence they have been introduced into the Old World, and become universally diffused, from the fondness of Asiatics for warm condiments. The Hindoos, though cultivating the Capsicum extensively, have no specific name for it, but call it *Red Pepper.* "Chilli, either simply or in composition, being the Mexican name for all the varieties and species of this genus" (*R. Brown*), indicates that the genus is American. Many varieties have no doubt been raised to the rank of species. The genus is distinguished by its berry-like but dry fruit.

The officinal Capsicum (*C. annuum*, Linn., *fastigiatum*, Blume) is annual, smooth, dark-green in colour, from 1–2 feet high, with branched, furrowed, angular stems. Leaves ovate, acuminate, sometimes lanceolate, entire, shining, sometimes hairy beneath on the veins. Flowers small, white, axillary, solitary, drooping. Calyx 5-cleft. Corol rotate, equal. Stamens 5; filaments short; anthers dark-coloured, connivent, opening longitudinally. Fruit firm, succulent, 2-celled, containing numerous dry flat seeds. The fruit varies much in form, being round, oblong, cordate, or horned, and either scarlet or yellow, and more or less pungent in taste. The horn-shaped variety is most common, from 2–3 inches in length, and from $\frac{1}{2}$–1 inch diameter at the base. These are usually called Capsicums, and the plant *C. annuum.* One variety, called Cockspur-pepper, has the fruit long and slender. Sometimes the fruit is globose or lobed: the variety is then called *C. baccatum.* When the fruit is small, elongated, and pointed, the variety is called Bird-Pepper, and botanically *C. minimum.* When the plants are allowed to grow beyond the year, they become shrubby, and form the species or variety called *C. frutescens.* Cultivated in all hot countries, but also under glass in this country.—Nees von E. 190; St. and Ch. 44. (Fruit known in commerce as *Guinea Pepper* (Africa) and *Pod Pepper* (E. and W. Indies), B.)

The Berry or fruit of the Capsicum, in its dried state, is the only officinal part. Some berries are 2 or 3 inches long, but others, which are much smaller, are preferred. "Pod membranous, from 5–8 lines long, 2 lines broad, straight, conical, smooth, shining, pointed, somewhat corrugated, orange red, intensely hot in taste." (B.) These fruits, when powdered, form Cayenne Pepper, but are often preserved in vinegar as a pickle, and the fluid employed under the name of Chili Vinegar. The active properties are taken up also by water, Spirit, Ether, and fixed oils. Analysed by Forchhammer, a red Colouring matter, a nitrogenous substance, Mucilage, and some salts were found; and at the same time a neutral, resinous, active principle, *Capsicine*, white, brilliant, pearly, and very acrid. Braconnot describes the active principle as of an oleaginous nature, very acrid in taste, ready volatilising, and diffusing a very acrid vapour.

Action. Uses.—Rubefacient, Acrid Stimulant. Much used as a Condiment in hot countries. Sometimes used as a Counter-Irritant, with salt as a stimulant in Scarlatina maligna, as a Gargle in relaxed sore throat, or in the form of Cayenne Lozenges.

TINCTURA CAPSICI, B. Tincture of Capsicum.

Prep.—B. *Bruised Capsicum* ℥¾, in *Rectified Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Irritant. Stimulant in doses of ♏v.–fʒß, or as a Gargle (fʒiv. to Inf. Rosæ f℥viij.) Dr Turnbull uses a concentrated Tincture (℥iv. to Rect. Sp. f℥xij.) as a Counter-Irritant.

STRAMONII FOLIA, B. Datura Stramonium, *Linn.* Leaves, dried. STRAMONII SEMINA, B. Seeds, ripe. (Cultivated in Britain.) Thornapple.

Species of Datura (Sans. *Dhatoora*) have long been employed medicinally by the Hindoos, and were thus made known to the Arabs, who curiously give Stramonia as a synonyme of Datura. It is their *jouzmasil*, that is, *masil* or *methel*, which has long been referred to Datura. *D. Stramonium* occurs in the Himalayas (*see* Himal. Bot. p. 279), and is probably indigenous in the Hindoo Khoosh, whence most likely it was taken to Constantinople, having been obtained by Gerard from that city, and by Fuchsius from Italy.

Fig. 88.

The Thornapple (fig. 88) is an annual of vigorous growth, about 3–5 feet high. Stem much branched, dichotomous above, bushy, fœtid, smooth. Root large, white, and fibrous. Leaves from the forks of the stem, large, unequal at the base, ovate, unequally sinuate-dentate, smooth, variously and acutely sinuated and toothed, simply veined, of a light dull-green colour. Flowers axillary, erect, white, sweet-scented, especially at night, about 3 inches long. Calyx oblong, tubular, ventricose, 5-angled, 5-toothed, dropping off and leaving a circular mark round the base of the ovary. Corolla funnel-shaped, regular, angular, plaited with mucronate lobes. Stamens 5. Stigma thick, obtuse, 2-lobed. Ovary 4-celled. Capsule as large as a walnut, dry, very prickly, 4-valved, with 2 partially bipartite cells, containing many brownish or black flattened reniform seeds.—Waste places and dung-heaps in all parts of Europe, also in North America. No doubt introduced from Asia. Flowers in July.—Nees von E. 193; St. and Ch. 6.

The whole plant has a rank odour, which may be detected at a distance. All parts possess medicinal properties; the leaves and seeds are officinal. The *seeds* are brownish or black, flattened, kidney-shaped, rough, without odour, except when bruised, but with a bitter weakish taste; often employed for poisoning in India, where pulses form so large an article of diet. The *leaves* should be gathered when the plants are in flower. (B.) They have a fœtid odour, especially when bruised: it is strongest while they are drying. Their taste is rather bitter and nauseous.

Analysed by Brandes, the seeds yielded Fixed Oil, Wax, Resin, Extractive, Gum, Albumen, &c., with salts, and a Malate of *Daturia*. This alkali has been obtained by Geiger and Hesse, who described it as occurring in brilliant crystals, without odour, and colourless, having a bitterish, tobacco-like taste, alkaline, easily soluble in Alcohol, less so in Ether, forming salts with acids. It requires for solution 280 parts of cold, 72 of boiling water. It resembles Hyoscyamia. Planta calculates the equiv. to be $C_{34} H_{23} N O_6$. The fresh leaves of Stramonium did not yield Promnitz anything except the ordinary vegetable constituents, though they must also contain the Daturia. Mr Morries Sterling, by the destructive distillation of Stramonium, obtained an empyreumatic oil, which contained an active poisonous principle.

Action. Uses.—Anodyne. Antispasmodic, and as such may be combined with Valerian. By relieving pain, it will induce sleep; and it affects the constitution much in the same way as Belladonna, in doses of the powder, gr. j.–gr. v. In Neuralgic and in Rheumatic pains it has given relief both when taken internally and applied externally. It has also been considered calmative in Mania. In Spasmodic Asthma smoking the leaf (gr. x.–ʒß) often gives instantaneous relief; but it must be exhibited with care. M. Trousseau recommends its being smoked with an equal quantity of Sage leaves, in a roll of paper. In India Dr Royle used to order it to be added to the ordinary chillum of Tobacco; or prescribe inhalation from water in which Datura leaves had been infused. Mr Skipton found f℥ij. of an infusion of the root (℥j. to Aq. Ojß) of *Datura fastuosa* give great relief. But the most convenient practice is that of smoking the Stramonium cigars, which are prepared by some chemists.

Daturia is an energetic poison, and very small quantities cause dilatation of the pupil.

EXTRACTUM STRAMONII, B. Extract of Stramonium Seeds.

Prep.—B. Take of *Stramonium Seeds*, in coarse powder, ℔j.; *Ether*, Oj., or a sufficiency; *Distilled water* and *Proof Spirit*, of each a sufficiency. Shake the Ether in a bottle with water Oß, and after separation decant the Ether. Pack the Stramonium in a percolator, and free it from its oil by passing the washed Ether slowly through it. Having removed and rejected the ethereal solution, pour the spirit over the residue of the Stramonium in the percolator, and allow it to pass through slowly until the powder is exhausted. Distil off most of the spirit from the tincture, and evaporate the residue by a water bath until the extract has acquired a suitable consistence for forming pills.

(The seeds of Stramonium contain a large proportion of fixed oil, which hinders the formation of an extract. Mr Whipple proposes to separate this first by expression. This new process of the B. P. removes it by means of Ether in which the Daturia is insoluble.)

Action. Uses.—Anodyne. Antispasmodic in doses of gr. ¼–gr. iij., or it may be made moist and applied over a pained part.

TINCTURA STRAMONII, B. Tincture of Stramonium.

Prep.—Bruised *Stramonium Seeds* ℥ijß, *Proof Spirit* Oj. Prep. as Tinct Aconiti.

Dose.—fʒß, 2 or 3 times a-day.

Antidotes.—Stimulant emetics, cold affusion, with blisters to nape of neck, as in cases of poisoning with Belladonna.

HYOSCYAMI FOLIA, B. Hyoscyamus niger, *Linn.* The leaves and branches of the indigenous biennial plant, dried. Henbane.

Henbane has been employed in medicine from the earliest times; is the ὑοσκύαμος of the Greeks, and the *bunj* of the Arabs. The seeds are known by the name of *Khorassani Ujwain* in India.

Henbane (fig. 89) is annual or biennial—that is, plants grown from the seed of the biennial variety will, in favourable conditions of the soil and climate, come to full perfection in the first year. Roots spindle-shaped, those of biennial plants having considerable resemblance to small parsnip-roots in the winter and spring. (*Houlton.*) The plants in the first year throw up a tuft of radical leaves which are petiolated, woolly, and possess little of that clamminess and odour which are peculiar to the mature plant. In the second spring, another set of leaves make their appearance with, and attached to the flowering stem. This is from 1 to 3 feet high, seldom branched, hairy; hairs glandular, and viscid. Leaves sessile, subamplexicaul, occasionally decurrent, lower ones sometimes stalked, oblong-acute, coarsely and unequally cut or sinuate, appearing pinnatifid, clammy, and fœtid, of a pale dull-green colour, slightly pubescent with long glandular hairs, like those of the stem, upon the midrib. Flowers nearly sessile, axillary, subsolitary, unilateral, erect, much shorter than the leaves. Calyx funnel-shaped, 5-lobed, villous. Corol (2) funnel-shaped, limb spreading, 5-lobed, not quite equal, of a dull straw-colour, marked with dark purple veins. Stamens 5, declinate; filaments pubescent. Ovary ovoid, shining, 2-celled, with numerous ovules attached to the placentæ. Style filiform. Stigma (1) capitate. Capsule opening transversely by a convex lid, 2-celled, many-seeded. Seeds small, roundish, finely dotted, of a light grey colour.—Indigenous in waste grounds throughout Europe, also in the Persian region of Botanists.—Nees von E. 192; St. and Ch. 9. Two varieties, biennial and annual, are (or were) cultivated at Mitcham. The latter is smaller, and its corolla often without the purple veins.

Henbane plants generally come into flower about the beginning of June, but the annual plants a little later: the seeds ripen from August to October. There are two varieties of the Hyoscyamus, the annual and the biennial kind. The latter, being most esteemed, is cultivated by Mr Ransom, at Hitchin, where about 4 acres are set apart for it. The yield is from 1–5 tons of leaves per acre annually. The leaves of the first year are gathered in August to be sold as *Folia Hyoscyami*. Those gathered in July of the second year are more active, and are used to make the extract. From 4 to 7½ ℔ of this are obtained from 1 cwt. of the plant. (P. J. 1860.) Some are of opinion that the biennial plant should alone be employed medicinally (as ordered by the B. P.), and that the leaves should be collected when the first flowers begin to appear. But it has not been proved that annual plants, when properly grown, are devoid of active properties. Dr Royle was in the habit of largely cultivating Henbane in the Botanic garden at Saharunpore, where, from the nature of the climate, the whole process of cultivation, including the ripening of the seed, was completed between the months of October and

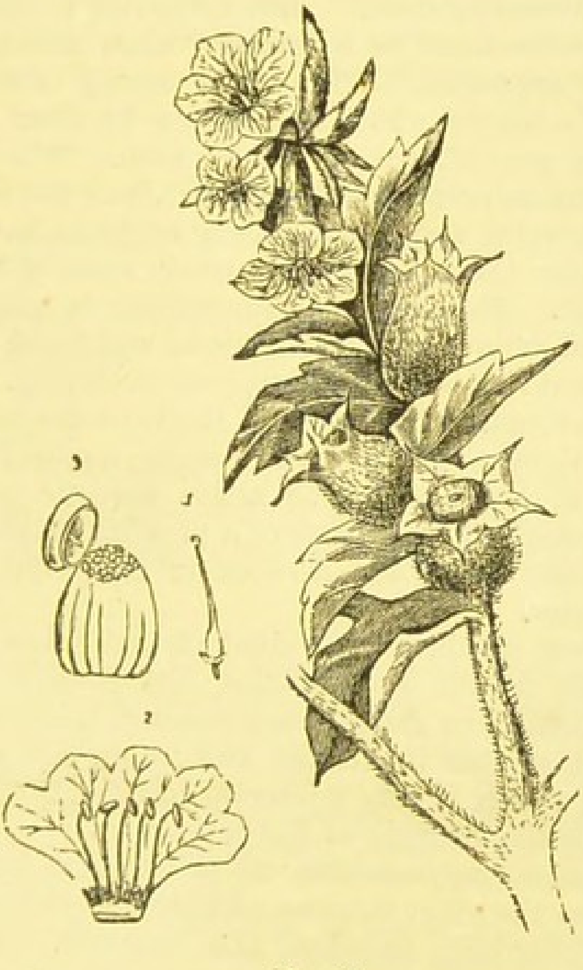

Fig. 89.

March. The Extract made from these plants was highly approved of by several medical officers, and pronounced by Mr Twining, after trial in the General Hospital at Calcutta, to be of "most excellent quality" (Himal. Bot. p. 281). But the secretions of plants growing in a colder and moister climate, or in seasons having these characteristics, may not come to as great perfection in the first year. Dr Christison states, from experiments made in the Royal Infirmary at Edinburgh, "that inferiority of cultivated plants, if it exists at all, seems not appreciable in practice;" and, with respect to the period at which the leaves acquire their activity, he says, "I have found them sufficiently active even in the spring, before the appearance of the flowering stem." But according to the directions of the B. P., the leaves must be collected "when about two-thirds of the flowers are expanded." They then spring from the stem. The old last year's leaves, which are known by their long stalks springing from the ground, are not to be used. When collected, they should as soon as possible be separated from the stem, spread out, and dried in a warm airy room. They ought to have a mucilaginous, slightly bitter taste, and should retain some of the peculiar odour of the plant. The leaf of Hyoscyamus is sessile, oblong, acutely sinuous, and subqubescent with viscid and fœtid hairs. The strong odour and acrid taste nearly disappear on drying.

Lindbergson has found in the leaves of Henbane the usual gummy matters of plants, along with a bitter extractive, a narcotic principle, and various salts of Magnesia. The active narcotic principle was discovered by Brandes to be a *Malate* of a peculiar alkaloid, *Hyoscyamia*, which strongly resembles *Atropia* in its properties, but is more soluble in water.

Geiger and Hesse obtained this alkaloid in groups of radiated needle-like crystals, fusible and volatile, but readily decomposed when distilled, alkaline in nature, neutralising acids and forming crystallisable salts, soluble in Alcohol and Ether, less so in water. Pure *Hyoscyamia*, which is very poisonous, dilates the pupils, and, when moistened, smells strongly of Tobacco.

A highly poisonous empyreumatic oil is obtained by destructive distillation, as from the other Solaneæ and from Foxglove.

Action. Uses.—Narcotic, Anodyne, and Soporific. Available for a variety of cases where we wish to relieve pain, allay irritability, and procure sleep, having the advantage of not constipating the bowels like Opium. Hence it is frequently prescribed with Calomel, Purgatives, or with Antispasmodics. It may be given internally in powder in doses of gr. v.–gr. x., or in Extract or Tincture; or it may be applied externally in the form of fomentation, or in cataplasms of its leaves, or its Extract or Tincture used as those of Belladonna.

(Professor Liebig, and, more recently, Dr Garrod, have found that *Liquor Potassæ*, and other caustic fixed alkalies, destroy the activity of Henbane, Stramonium, and Belladonna, but that the carbonates and bicarbonates do not possess this power. The caustic alkalies must not, therefore, be prescribed with these medicines, their carbonates may. It appears that the active principle in ʒj. of Tincture of Henbane is entirely destroyed by 10 drops of Solution of Potash, Atropine, mixed with Caustic Potash, loses all power of dilating the pupil.)

Extractum Hyoscyami, B. Extract of Henbane.

Prep.—B. As Extractum Aconiti, B., from the *fresh Leaves* and young *Branches* of *Henbane.*

Action. Uses.—The expressed juice evaporated spontaneously in a dry current of air, or *in vacuo*, forms an excellent preparation. A still more powerful preparation may be obtained by the action of Alcohol. The Ext. is adapted for all the purposes of Henbane in doses of gr. v.–gr. xx.

Tinctura Hyoscyami, B. Tincture of Henbane.

Prep.—B. *Hyoscyamus leaves*, in coarse powder, ℥ijß, in *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Narcotic, &c. in doses of ♏x. as soothing, or fʒj. to fʒij. as a Hypnotic.

Tabaci Folia, B. Nicotiana Tabacum, *Linn.* The dried Leaves. (Cultivated in America.) Tobacco. *Leaf Tobacco.*

Tobacco was introduced from the New World about the middle of the 16th century, and is now extensively cultivated in most parts of the world.

Root fibrous. Stem erect, branched, and viscid, from 2 to 6 feet high. Leaves sessile, oblong, lanceolate, the lower ones decurrent, very large, a little hairy, viscid. Flowers in terminal panicles. Bracts linear-acute. Calyx tubular, swelling, 5-cleft, hairy, glutinous. Corol rose-coloured, funnel-shaped, throat inflated, ventricose, limb spreading, plicate, with 5-cleft acuminate segments. Stamens 5, declinate. Ovary ovate. Style long. Stigma emarginate. Capsule usually 2-celled, 2-valved, opening crosswise at top, valves finally bifid. Seeds numerous, small, kidney-shaped, attached to fleshy placentæ. —Warm parts of America, but now cultivated in most parts of the world.—Nees von E. 194; St. and Ch. 37.

Most of the Tobacco of commerce, as that of Virginia, is yielded by this species, as is that of India. Small Havannah cigars are said to be formed of the leaves of *N. repanda*, the Syrian and Turkish Tobaccos to be yielded by *N. rustica*, and the fine Shiraz Tobacco by *N. persica*, Lind.

Tobacco, as it occurs in commerce, is of a yellowish brown colour, soft and pliable, a little clammy, with something of a honey smell, mixed with a narcotic odour; the latter, however, is not obvious in the fresh leaves. The taste is bitter, acrid, and nauseous. Virginian Tobacco, though the strongest, is best adapted for medical use, in order to observe uniformity of strength. The B. P. orders that the Tobacco used shall be imported, "not manufactured" in England. The active properties are taken up by water, Spirit, and Wine, but are destroyed by heat. Tobacco was elaborately analysed by Vauquelin. *Nicotianin* (a concrete Volatile Oil) was discovered by

Hermbstadt in 1821. The analysis of Posselt and Reimann displayed the presence of *Nicotia* ·06, of *Nicotianin* 0·01, Extractive 2·87, Gum 1·74, Chlorophyll 0·26, Vegetable Albumen and Gluten 1·30, Malic acid 0·51, Lignin and Starch 4·65, Salts 0·73, Silica 0·08, Water 88·28=100 nearly. *Nicotia* has since been studied by Boutron and Henry. Orfila obtained it by passing tobacco-smoke into water acidulated with Sulph. acid, decomposing the sulphate by Potash, and volatilising the alkaloid by heat. It is a limpid, oily, volatile liquid, devoid of colour, having an acrid taste, and a weak smell of Tobacco, stronger when heated. Its vapours are extremely acrid, with an overpowering odour of Tobacco. It has a Sp. Gr. of 1·048, is alkaline, forms salts with acids, is soluble in Alcohol, Ether, and water, and in fixed and volatile oils. It is volatile at 77° F. It reacts with most metallic bases in the same way as Ammonia. It is turned red by strong $S\,O_3$; disengages white vapours with cold $H\,Cl$, and produces a violet colour when heated with that acid. Heated with Nit. acid it passes through several shades of yellow and red. It differs also from Ammonia in being precipitated by Tannic acid, and in giving with Perchlor. Gold a precipitate which is soluble in excess of Nicotia. It is the active principle of Tobacco, and is extremely poisonous. Nicotia exists in combination in Tobacco, and is found varying in proportion from 4 to 12 parts in 1000. It is composed of $C_{20}\,H_{14}\,N_2$. *Nicotianin* is a camphoraceous volatile oil, bitterish in taste, having the odour of Tobacco, and seeming to owe its properties to a little Nicotia intermixed with it. By the destructive distillation of Tobacco, an *empyreumatic oil* is formed, which is better known as produced in tobacco-pipes, and as being highly poisonous. This seems also to be a volatile oil holding some Nicotia in solution.

Action. Uses.—Local Stimulant, hence used as an Errhine and Sialagogue: secondarily Sedative, Antispasmodic, also Emetic, Laxative, and Diuretic; it acts upon the system, to whatever surface it is applied. Chiefly employed to produce relaxation in Spasmodic affections, as in strangulated Hernia, obstinate constipation from spasm of the bowels, or retention of urine from that of the urethra. When Nicotia is taken into the system gradually, as in smoking, it does not generally act as a poison, because it passes out of the blood into the urine and other secretions, nearly as fast as it is absorbed.

ENEMA TABACI, B. Tobacco Enema.

Prep.—B. Infuse in a covered vessel for half an hour *Leaf Tobacco* gr. xx. in *boiling water* ℥viij., and strain.

Action. Uses.—Sedative, Antispasmodic. Used only in the above cases. 20 gr. are sufficient for trial at first.

Sub-Class IV. Apetalæ.

Polygoneæ, *Juss.* Buckwheats.

They are found in the greatest numbers in the temperate regions of the northern hemisphere, but some in almost all parts of the world. The young shoots of many are acid (chiefly containing Oxalic acid); when older, an astringent, together with a purgative principle, is secreted by species of Rheum and of Rumex. The seeds of many, as the Buckwheat or Fagopyrum, afford nutritious flour. *Coccoloba uvifera*, or the Seaside Grape, is said to yield Jamaica Kino.

Polygonum Bistorta. Bistort.

The rootstock of this indigenous plant contains a large proportion of Tannin, some Gallic acid, and Starch, with woody fibre, and has a rough astringent taste. It is dark brown, rugose with annular rings, often twice bent on itself. It is not now officinal.

Action. Uses.—Astringent, either internally in doses of gr. xv.–ʒß, or made into a decoction, in doses of f℥jß; or externally as a lotion; has also been prescribed in Intermittents.

Various indigenous species of *Rumex*, or Dock, have been employed in medicine. The roots generally contain a bitter principle. *R. acetosa*, the common *Sorrel*, secretes in its leaves Binoxalate of Potash. So also do others of the genus, in a less degree.

Rhei Radix, B. One or more undetermined species of Rheum. The root deprived of the bark, and dried. (From China, Chinese Tartary, and Thibet.) Rhubarb.

The name Rheum is derived from the ῥέον of Dioscorides; but his description does not well apply to modern Rhubarb. This was, however, known to Paulus Ægineta, &c. The Arabs were acquainted with several kinds, as Indian, Khorassanee, Chinese (their *rewund sini*). The Persians give *reon* as the Greek synonyme of their *rawund*, which is Rhubarb, and of which the plant they say is called *ribas*. Rhubarb is no doubt the rootstock of a species of Rheum, but the species is still unknown. Dr Royle, after giving in another work (Him. Bot. pp. 314–318) an account of the commerce of Rhubarb, stated that the information collected by him on this subject "would bring the Rhubarb country within 95° of E. long. and 35° of N. latitude, that is, into the heart of Thibet. As no naturalist has visited this part, and neither seeds nor plants have been obtained thence, it is as yet unknown what species yields the Rhubarb." This is now the general opinion. Sievers, an apothecary sent in 1790 by the Russians to investigate the subject, had previously said, that "his travels had satisfied him that as yet nobody, that is, no scientific person, has seen the true Rhubarb plant." Dr Fischer when in London, subsequent to the above publication, informed Dr Royle that all the information obtained of late years in Russia only confirmed what was previously known, that *Rheum palmatum* is not the species, but that the genuine plant is a small one with roundish denticulate leaves. So more recently, Calau, apothecary in the

Rhubarb factory at Kiachta, says: "All that we yet know of the Rhubarb plant or its origin is defective and wrong; every sacrifice to obtain a true plant, or the seed, has been in vain; nor has the author been enabled to obtain it." Dr Falconer entered Thibet from the side of Cashmere, and proceeded as far as the Muztah range, or about long. 77° E. and lat. 36°, a region where Rhubarb was sent as a present to the Chief Ahmed Shah from the true Rhubarb country, but was unable to learn anything respecting commercial Rhubarb. He discovered new species of Rheum, and obtained specimens of genuine Extract of Rhubarb, *ossareh-rewund*, or Rhubarb-juice, a name which he as well as Dr Royle found applied in North-west India to Gamboge. He also found Rhubarb-root employed there as a yellow dye. Some information might probably be procured respecting Rhubarb from the traders to Upper Assam.

RHEUM, *Linn.* *Enneandria Monog.* Linn.

Flowers complete; perianth petaloid, 6-parted, with equal segments. Stamens usually 9, inserted in pairs into the base of the 3 outer segments, and singly into the 3 interior; filaments subulate; anthers versatile. Ovary triangular, 1-celled. Ovule single, basilary, orthotropous. Styles 3, short, reflexed. Stigmas 3, entire, subdiscoid, spreading. Achænium 3-cornered, broadly winged, supported by the withered perianth at the base. Seed erect, triangular Embryo straight, antitropous, in the axis of farinaceous albumen. Cotyledons flat, radicle short, superior.

Herbaceous plants, with perennial and branching rootstocks, which are thick and succulent. Stem of most 4 to 10 feet high, except in Nos. 1 and 2. Leaves large, more or less cordate, wavy at the margin, sheathing at the base, either all radical, or, where cauline, alternate. Inflorescence paniculate, or spicato-racemose. The species are valuable, not only on account of their rootstocks or Rhubarb, but also from the agreeable acidity of their leaf-stalks, employed for making sherbets, tarts, &c. They inhabit cold parts of the world, as the southern part of Russia, Siberia, Thibet, the north of China, and the Himalayan mountains, also Affghanistan and Persia. Hence all may be grown in the open air in Europe, and several are so cultivated. As no species seems more entitled than another to be considered as yielding either the Russian or Chinese Rhubarb of commerce, we shall briefly enumerate all, without describing any.

With Spike-like Racemes.

1. RHEUM SPICIFORME, *Royle.* (Illustr. Himal. Bot. p. 318. t. 78.) Kherang Pass and other places in Kunawar. Found by Dr Falconer in Thibet.

2. R. MOORCROFTIANUM, *Royle.* (*l. c.* p. 318. Lindl. Med. Bot. p. 356.) Niti Pass in the Himalayas. Found by Dr Falconer in Thibet.

These two specimens differ in their inflorescence from the other described species. Their roots are more dense in texture and of a more yellow colour than those of *R. Emodi* and *R. Webbianum.* The powder of both is of a light and bright yellow colour. Dr Falconer met with both in Thibet, and discovered another species of this group. It is probable that the commercial species will be found to resemble these in habit, from being indigenous, like them, in the elevated, arid, and cold regions of Tartary.

With Compound Racemes.

3. R. EMODI, *Wall.* Bot. Mag. t. 3508. *R. Australe,* Don. Sweet, Fl. Gard. t. 269. Nees von E. Suppl. t. 31. A. and B. Lindl. Fl. ed. p. 354.

4. R. WEBBIANUM, *Royle, l. c.* 318, t. 70, a. Choor Mountain. Niti Pass. This yielded the Rhubarb submitted to experiment by Mr Twining. Trans. Med. Soc. Calc. iii. p. 439.

5. R. RIBES, *Linn.* Dill. Elth. t. 158. f. 192. An. Mus. 2. t. 49. *Ribas* and

rivash of the Affghans and Persians, much celebrated among them, and much esteemed on account of the agreeable acid of its leaf-stalks. The root is said to be *rawund.* It is the *Riwas* of Serapion, who mentions it as making a good sherbet. It is said also to be found on the mountains of Syria.

6. R. RHAPONTICUM, *Linn.* Alpin Rhapont. i. t. 1. Nees von E. 113-14-15. Borders of the Euxine, and on the north of the Caspian Sea, deserts near the Volga, and in Siberia, as it is known to yield Siberian Rhubarb. Supposed to have yielded the Rhabarbarum of the ancients. Cultivated in this country on account of its stalks, and extensively at Banbury on account of its roots, and also at Rheumpole near Lorient, in the department of Morbiban in France.

7. R. CRASSINERVIUM, *Fischer.* Sent from St Petersburg to the Apothecaries' Garden at Chelsea. Roots large, and said to have the colour and odour of Turkey Rhubarb.

8. R. LEUCORHIZUM, *Pallas.* R. NANUM, *Sievers.* Ledebour, Il. Pl. Rose, t. 492. Found in the deserts of the Kirghis, and south of Siberia, and Altai Mountains. Said to yield *White* or *Imperial Rhubarb.*

9. R. UNDULATUM, *Linn.* Amœn. Acad. iii. t. 4. Nees von E. 116, 117. St. and Ch. 177. Lindl. Fl. Med. p. 357. A native of Siberia, Tartary, and China? Seeds of what was called the genuine Rhubarb plant were given to Kauw Boerhaave by a Tartar merchant, and these seeds produced this species and *R. palmatum.* This is said to be cultivated in France as one of those yielding French Rhubarb.

10. R. CASPICUM, *Fischer.* Caspian Shores and Altai Mountains. Lindl. p. 557.

11. R. COMPACTUM, *Linn.* Mill. Dict. 218. Nees von E. 121. A native of Chinese Tartary, said to yield some of the Rhubarb cultivated in France, which forms a fair imitation. Valued in this country on account of its stalks.

12. R. PALMATUM, *Linn.* This species is easily distinguished from the others by its roundish, cordate, half palmate leaves, with the lobes also deeply cut. Root large, branched, brown externally, of a deep yellow internally. Supposed to be a native of the mountains of Mongolia near the great wall of China. The seeds of this were received by K. Boerhaave with those of *R. undulatum* as those of the genuine Rhubarb; and it is thought, when cultivated in Europe, to resemble Chinese-Russian Rhubarb more closely than any other kind, in taste, odour, internal structure, and the action of some chemical reagents.

R. HYBRIDUM, *Murray*, is a doubtful species, but is remarkable for the great size of its roots as cultivated both on the Continent and in this country. This plant, with *R. Rhaponticum, compactum,* and *Emodi,* with hybrids from them, are those most commonly cultivated in this country on account of their stalks.

The greater part of the Rhubarb of commerce grows in Chinese Tartary, on the mountains and plains surrounding Lake Kokonor, near Thibet (*Pallas and Rehman*), especially in the province of Gansun, and is gathered in summer from plants of six years of age. When dug up, it is cleansed, peeled, cut into pieces; these are bored through the centre, strung on a string, and dried in the sun. In the autumn it is brought to Sinin, where the Bucharian traders reside, and from thence sent to the Russian frontier town of Kiachta, and to Pekin, Canton, and Macao. Considerable care is bestowed at the Russian factory in examining and separating the good from the inferior pieces, and from impurities; and in paring the Rhubarb to remove remaining portions of the bark, also the upper part of the root; and in perforating all pieces so as to examine their interior, because many, though sound externally, soon decay internally; it is supposed from over-rapid drying. Dr Royle, however, found most old roots of *R.*

Webbianum more or less decayed. It is collected in quantities of 40,000 pounds before it is imported into the European parts of Russia, packed first in bags, and placed where there is a free current of air,—afterwards in chests.

1. *Russian*, called also *Turkey Rhubarb*, but which in Russia is called *Chinese Rhubarb*, is imported into the frontier town of Kiachta, and then sent to Moscow and St Petersburg, whence it is distributed to the rest of Europe. It varies in shape, being irregularly roundish and angular, from the bark having been shaved off with a knife; some pieces are cylindrical, a few flattish, many pierced with holes. Externally it is smooth, of a yellow colour; internally, the texture is rather dense; the fracture is uneven, irregularly marbled with white and red veins; it has a strong and peculiar, slightly aromatic odour, a bitter, rather astringent taste, feels gritty when chewed, tinges the saliva yellow, and produces a powder of a bright yellow colour. Mr Quekett obtained from 35 to 40 per cent. of raphides, or conglomerated crystals of oxalate of Lime, which are situated within the cells, and which are the cause of the grittiness experienced when Rhubarb is chewed. This is the best kind of Rhubarb. It should be "free from brown specks externally and internally. Boracic acid should not turn the yellow exterior brown." (B.)

2. *Bucharian Rhubarb*, which makes its way to Vienna by Brody and Nischny, seems, from specimens and information afforded by Mr Faber to Dr Pereira, to consist of inferior kinds of the above Rhubarb, much of which, as inferred by the latter, would be burnt if presented to the Russian authorities; it therefore finds its way into Europe by other channels. It is intermediate between the Russian and the Chinese Rhubarbs, and is generally of inferior quality.

3. *Chinese*, sometimes called *East India Rhubarb*, consists of two or three varieties. 1. One called by Dr Pereira *Dutch-trimmed*, or *Batavian Rhubarb*, and, according to the shape, called *Flats* or *Rounds* in the trade, is closely allied to, and is derived, with very little doubt, from the same sources as the Russian Rhubarb; some of which, as mentioned above, finds its way to Canton, and is thence imported into Europe, or first into one of the Indian ports, and thence re-exported to Europe. It resembles the above in appearance, as the cortical portion appears to have been sliced oft, and not scraped. The holes with which the pieces are perforated often contain within them pieces of the string by which they had been strung together. 2. Another variety, which is more particularly called *Chinese* or *East India Rhubarb*, also *half-trimmed*, is distinguished from that called Russian, as being irregular in shape, never angular, but with the edges rounded, as if the bark, instead of being sliced, had been scraped off; often some of it still remains adherent; the roots are, besides, of less uniform good quality than the Russian. Externally they are of a duller yellow; many of the pieces are heavier from being more compact; the reticulation is less regular, and of a yellowish-brown colour. 3. A third variety has been described by Dr Pereira under the name of

Canton Stick Rhubarb. This is in *cylindrical* pieces, about two inches long, and from half to three-quarters of an inch in diameter. These are probably produced in the mountains which bound China, as those of the province of Sechuen, and perhaps of Kansu.

(These three kinds of Rhubarb are all produced within the limits of the Chinese Empire, and were therefore included under the term *Rheum Sinense*, adopted by the L. C.)

4. *Siberian Rhubarb.*—Small quantities of this kind have been imported by Mr Faber, and have been proved to be those called by Grassman and others *Siberian Rhapontic Root.* This occurs in long, thin, almost cylindrical or spindle-shaped pieces, decorticated and perforated by a hole. Colour, externally pale yellow, internally brownish-yellow or reddish-white. Odour and taste of good Rhubarb, but weaker ; does not feel gritty. Dr Pereira compares it with English *Stick Rhubarb* (*see* P. J. iv. 448 and 500). It has since been proved (P. J. vi. p. 74) that the Rhubarb cultivated at Banbury is yielded by the same species, that is, *Rheum Rhaponticum.* M. Guibourt states that *R. undulatum* was extensively cultivated in Siberia by order of the Empress Catherine, the seeds having been obtained from China. Some few chests of Rhubarb, supposed to be the produce of this plant, were exported from Russia in 1853. They were said to be the last that remained, the culture having been abandoned as unprofitable. (P. J. xiii. 329.)

5. *Himalayan Rhubarb.*—This is produced by different species, and is of very different quality. That yielded probably by *R. Moorcroftianum*, given to Dr Royle by Major Hearsey, the companion of Mr Moorcroft, was of a bright but light yellow colour, and, as stated by Dr Royle in 1827, "appeared both in sensible qualities and medical virtues to equal the best rhubarb that he had ever seen." (*Trans. Med. Soc. of Calcutta*, iii. p. 439.) The Rhubarb of *R. Webbianum* was tried by Dr Royle in both the Military and the Civil Hospital at Saharunpore, and found to be of very good quality. Some of it was subsequently submitted by the Medical Board to the late Mr Twining, for experiment in the General Hospital at Calcutta. After trial in 43 cases, he reported that in doses of gr. xx.-gr. xxx. it has a good purgative effect, operating nearly as freely as the best Turkey Rhubarb ; and further, that the effects of small doses of the remedy, as a tonic and astringent, are highly satisfactory ; also, that it "is very efficacious in moderate doses for such cases as Rhubarb is generally used to purge." After a further trial in 4 cases of Diarrhœa, he reports, "If further experiments should confirm the efficacy of the Himalaya Rhubarb in such cases, the acquisition of this remedy to the Materia Medica of this country will be of the utmost importance. (*l. c.* p. 445.)

The Rhubarb differs much in appearance from that of commerce. The bark, of a brownish colour, has not been taken off. The texture is radiated, rather spongy, the colour a yellowish-brown, the powder of a dull brownish-yellow colour, having little aroma (though when fresh dried the root was described as aromatic by Mr Twining), with a bitter and rather astringent taste. Dr Royle selected the branches of the roots, for he found the rootstock generally decayed in the centre. They were cut into short pieces, and slung upon string for the facility of drying. Some of the Himalayan Rhubarb is probably yielded by *R. Emodi*, and perhaps by other undiscovered species of Nepal, and of the passes towards Bootan. Their value must be decided by their medical effects in the cases for which they are suited, and not by their differing in appearance from other species.

6. *English Rhubarb.*—This is (or was) cultivated at Banbury, in Oxfordshire, to the extent of more than twenty tons annually, and is the produce of *Rheum Rhaponticum* (*see* P. J. vi. p. 75). It is the kind frequently sold by men dressed up as Turks as Turkey Rhubarb. The pieces vary in shape, some being ovoid, others cylindrical (*English Stick Rhubarb*), smoothed externally, and rubbed with a yellow powder; light, rather spongy, with a reddish hue. It is rather mucilaginous in taste, and a little astringent. Its odour is feeble, but unpleasant. It is supposed that much of this is employed for adulterating the Asiatic Rhubarb when in a powdered state (*see* P. J. vi. pp. 74 and 76).

The chemistry of Rhubarb cannot be considered to be in a satisfactory state. But from investigations of various observers it may be concluded that this root contains—

1. *Rheine*, a peculiar neutral principle, called also *Chrysophanic acid*, soluble in alkalies, forming a reddish or brown solution, supposed by some to be the active constituent, and metamorphosed by oxidising agents into *Erythrosic acid.* It is said to have the composition ($C_{20} H_8 O_6$).

2. Three acrid resins, discovered by Schlössberger, yellowish in colour, differing in their solubility in ether and alcohol, and named *Aporetine*, *Phæoretine*, and *Erythroretine.* The last produces with an alkali a purple solution.

3. *Tannic* and *Gallic* acids, with *bitter extractive.* The two acids are found most in the reddish veins which traverse the root.

4. Crystallised *Oxalate of Lime.* This is deposited as Raphides in the cells of the root; and is contained in the largest quantity in Russian, in the least in English Rhubarb.

5. A minute quantity of *Volatile Oil* gives the peculiar odour.

6. *Starch*, *Sugar*, and *Lignine* are found in this root, as in most vegetable tissues. The starch grains of Rhubarb, as seen under the microscope, are exceedingly small. Adulterations of the powder with flour or other starches may thus easily be detected.

Dr Michaelis considers Rheine to be tonic, and the purgative property of Rhubarb to consist of the combination of Resin with Oxalate of Lime. He found 100 parts of Russian Rhubarb to contain *Rheine*, 4·3, *Resins* 10·3, *Ox. Lime* 15·2, *Astringent extractive* 14·7, *Woody fibre* 14, and the rest Starch and water. English Rhubarb yielded about the same amount of Rheine, about half as much each of Resin and Ox. Lime, and twice as much extract and woody fibre.

Rheine, called also Rhabarbarine and Chrysophanic acid, has also been investigated by M. Dulk, M. Garot, and Mr Cobb. It may be separated from the infusion by Lebourdais' Charcoal process (*see* Digitalin). It is a neutral bitter substance. It occurs in minute yellow prismatic crystals, fused by a gentle heat, and at a higher temperature partly sublimed, partly decomposed. It is slightly soluble in water: soluble in ether and in hot alcohol; insoluble in alkaline solutions. *Erythrosic acid* is often deposited slowly from Tincture of Rhubarb. It is supposed to be produced by the action of the oxygen of the air upon Rheine. It may be obtained in a purer state by digesting strong Nitric acid upon Rhubarb, when an insoluble orange powder is produced, which, after being well washed in water, may be separated by means of ether or hot alcohol into Erythrosic acid and an insol. residue. This acid produces a deep and splendid carmine solution when neutralised by a solution of an alkali. By this result of its oxidation, Rheine, or Rhubarb itself, may be easily recognised chemically.

The active principles of Rhubarb are taken up by water, either cold or hot, as also by proof Spirit. The alkalies produce generally a red-coloured solution with Rhubarb (on account of the presence of oxidised Rheine, or of Erythroretine?) The acids cause a precipitate in its infusion, as also does Gelatine. Sesquichloride of Iron causes a green-coloured precipitate. Tincture of Iodine produces a tawny muddiness.

M. Rillot has discovered a test by which to distinguish the powder of Chinese Rhubarb from that of *Rheum Rhaponticum* cultivated in Europe. The powder of Chinese Rhubarb, triturated with Magnesia and Essence of Aniseed, undergoes no change of colour. Rhapontic Rhubarb, or a mixture of the two, produces a salmon-rose or carmine colour with this test. (Journ. de Chim. Méd., June 1860.)

Action. Uses.—Cathartic, also mildly Astringent and Tonic. It causes considerable muscular action of the intestines, and produces fæcal rather than watery evacuations. The cathartic is followed by an astringent effect, which makes it particularly valuable in cases of Diarrhœa, where it first evacuates and then strengthens the intestinal canal. In small doses it acts as a Stomachic and Tonic. Its colouring matter is readily absorbed, and may soon be detected in the urine. It is much used as a Laxative for children, especially in combination with Magnesia, sometimes with Calomel, and is equally suitable as a Purgative in cases of Diarrhœa, with an antacid and aromatic, or in cases where a mild Cathartic is required.

Dose.—Of the powder gr. x.–gr. xx.

PULVIS RHEI COMPOSITUS, B. Comp. Rhubarb Powder.

Prep.—Mix thoroughly *Light Magnesia* ℥vj., *Powdered Ginger* ℥j., and *Powdered Rhubarb* ℥ij. Pass the powder through a fine sieve. (Two parts of Rhubarb in nine.)

Action. Uses.—Laxative and Antacid; well known as *Gregory's Powder.* In doses of gr. xx.–gr. lx. For children gr. v.–gr. x.

Pilula Rhei Composita, B. Comp. Rhubarb Pill.

Prep.—B. Take of *Rhubarb*, in powder, ℥iij.; *Socotrine Aloes*, in powder, ℥ij¼; *Myrrh*, in powder, ℥jß; *Hard Soap*, in powder, ℥jß; *Oil of Peppermint*, fʒjß; *Treacle*, by weight, ℥iv. Mix the Powders with the Oil, add the Treacle, and beat the whole into a uniform mass.

(Resembles the pill of the L. P., *Peppermint* being substituted for *Caraway.*)

Action. Uses.—Cathartic in doses of gr. x.–gr. xx. Well suited to a sluggish state of the bowels.

Extractum Rhei, B. Extract of Rhubarb.

Prep.—B. Take of *Rhubarb*, sliced or bruised, ℔j.; *Rectified Spirit*, f℥x.; *Distilled water*, Ov. Mix the Spirit and the Water, and macerate the Rhubarb in the mixture for four days; then decant, press, and set by, that the undissolved matter may subside; pour off the clear liquor, filter the remainder, mix the liquors, and evaporate by a water bath at a temperature not exceedng 160° to a proper consistence for forming pills.

(Made in the same way as the Extract of the L. P.)

Action. Uses.—Cathartic in doses of gr. x.–gr. xxx. A good preparation may be obtained with cold water and percolation, when Spirit is unnecessary (*c*); and a still better one by evaporation *in vacuo.*

Infusum Rhei, B. Infusion of Rhubarb.

Prep.—B. Infuse in a covered vessel for 1 hour in boiling *Aq. dest.* Oß *Rhubarb* in thin slices ℥¼. Strain.

Action. Uses.—Aperient and Stomachic in doses of f℥jß repeated. A good preparation may be made with cold water and percolation.

Syrupus Rhei, B. Syrup of Rhubarb.

Prep.—B. Take of *Rhubarb Root*, in coarse powder, *Coriander Fruit*, in coarse powder, āā ℥ij.; *Refined Sugar*, ℥xxiv.; *Rectified Spirit*, f℥viij.; *Distilled water*, f℥xxiv. Mix the Rhubarb and Coriander; pack them in a percolator; pass the spirit and water, previously mixed, slowly through them; evaporate the liquid that has thus passed until it is reduced to f℥xiij. and in this, after it has been filtered, dissolve the Sugar with a gentle heat.

Introduced in 1867. A pleasant purgative for children and delicate persons.

Dose.—fʒj.–fʒiv.

Tinctura Rhei, B. Tinctura Rhei Composita, L. Tincture or Compound Tincture of Rhubarb.

Prep.—B. *Rhubarb*, in coarse powder, ℥ij.; *Cardamoms*, bruised, ℥¼; *Coriander*, bruised, ℥¼; *Saffron*, ℥¼; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Cordial, Stomachic, in doses of fʒj. Purgative, f℥ß–f℥j.

Vinum Rhei, B. Wine of Rhubarb.

Prep.—Take of *Rhubarb Root*, in coarse powder, ℥jß; *Canella Alba Bark*, in coarse powder, gr. lx.; *Sherry*, Oj. Macerate for seven days in a close vessel with occasional agitation, then strain, press, filter, and add sufficient sherry to make one pint.

Introduced in 1867. A warm purge. Taken frequently in small doses in atonic dyspepsia.

Dose.—ʒj.–ʒij.

THYMELEÆ, *Juss.* (*Daphnoideæ.*) Daphnads.

They are found in the central parts of the temperate zones, and in mountainous situations, and are remarkable for the tenacity and lace-like appearance of their bark, as well as for its acridity.

MEZEREI CORTEX, B. Daphne Mezereum, *Linn.*, and D. Laureola, *Linn.* The Bark dried. Mezereon. *Octandria Trigynia*, Linn.

D. Mezereum is supposed to be included with *Daphne oleoides* under the *χαμέλαια* of Dioscorides. It is called *Mazrioon* in Persian works on Materia Medica, and *Khamela* is assigned as its Greek name.

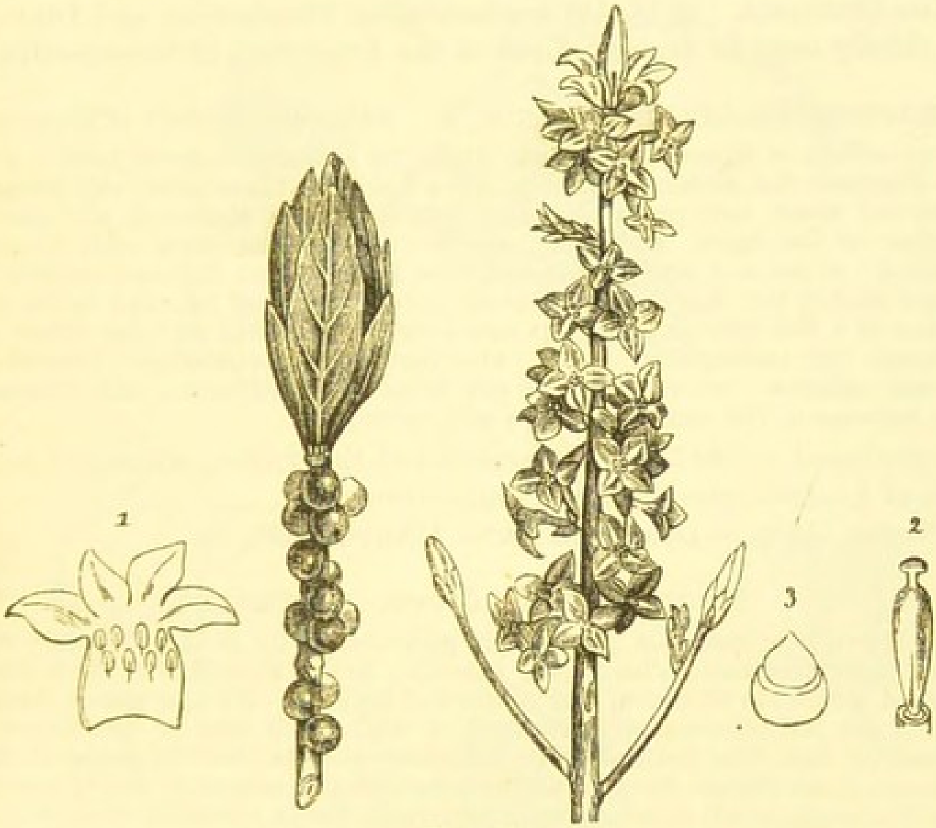

Fig. 90.

Daphne Mezereum (fig. 90) is a small shrub. Leaves lanceolate, tapering below, smooth, evergreen. Flowers subternate, lateral, arranged in a spike-like manner, appearing before the leaves, rose-coloured. Perianth 4-fid, segments ovate-acute, tube hairy. Stamens 8, short, inserted (1) in the tube of the perianth in two rows. Ovary (2) oval, oblong, with a short style and peltate stigma. Berry bright red, fleshy, 1-seeded (*see* 3, where some of the sarcocarp has been removed, to show the seed.)—Woods of central Europe, less common in Great Britain; cultivated in gardens as an ornamental shrub.—Nees von. E. 125; St. and Ch. 65.

D. Gnidium (Fr. *Garou*), *D. Laureola*, Spurge Laurel, and other species, are much employed on the Continent. The bark of the latter forms much of what is used in this country as Mezereon.—Squire, P. J. i. 395.

All parts of these plants are more or less acrid. The bark of the stem and root is the most efficacious part. It is tough and fibrous, as in all Daphnes. It is met with in strips which are of a light greyish colour externally, whitish and shining within; when fresh dried it has a slight but peculiar odour. The taste, especially of the inner part of the bark, is hot, acrid, and durable, though at first a little sweetish. These properties are imparted to water, Alcohol, Oils, and Vinegar. It contains a neutral crystalline principle, *Daphnine*, which is said to be devoid of activity. The active properties are owing to a peculiar *acrid resin*, and to an *acrid volatile oil*, which is described as highly irritant. The berries, according to Pallas, are employed as Cathartics, but in large doses will prove poisonous.

Action. Uses.—Epispastic. A piece of the bark moistened in vinegar, and applied to the skin, and renewed, will produce a blister. Guibourt recommends an Ointment as a substitute for Savine Ointment. It is also a stimulating Diaphoretic and Diuretic, but chiefly used as an ingredient of the Decoction of Sarsaparilla.

Extractum Mezerei Æthereum, B. Ethereal Extract of Mezereon.

Prep.—Take of *Mezereon Bark*, cut small, ℔j.; *Rectified Spirit* Oviij.; *Ether* Oj. Macerate the Mezereon in Ovj. of the Spirit for three days, with frequent agitation; strain and press. To the residue of the Mezereon add the remainder of the Spirit, and again macerate for three days, with frequent agitation; strain and press. Mix and filter the strained liquors; recover the greater part of the Spirit by distillation, evaporate what remains to the consistence of a soft extract; put this into a stoppered bottle with the Ether, and macerate for twenty-four hours, shaking them frequently. Decant the ethereal solution; recover part of the Ether by distillation, and evaporate what remains to the consistence of a soft extract.

Introduced in 1867. Rubefacient and Epispastic, employed in the form of Linimentum Sinapis Compositum, B.

Pharm. Prep.—Decoctum Sarsæ Compositum, B.

MYRISTICEÆ, *R. Brown.* Nutmegs.

The Myristiceæ resemble *Laurineæ* in properties. By Dr Lindley they were placed near *Anonaceæ*, which they resemble in the structure of their flower and seed, ruminate albumen, and position of embryo. He now places them in his Alliance Menispermales, in connection with which may be mentioned an interesting fact, first noticed by Dr Falconer—that is, that the seeds of *Spærostemma grandiflorum* have the albumen remarkably aromatic, nearly as much so as Nutmegs, which in aroma and taste they closely resemble when bruised or chewed. Myristiceæ are found within the tropics of Asia and America.

Myristica, B. Myristica officinalis, *Linn.* Kernel of the Seed. *Diœcia Monadelph*, Linn. (From Sumatra, the Molucca and Banda Islands.

Nutmegs, being the produce of the distant Spice Islands, were probably first known to the Hindoos (Sans. *Jae-phul*, Java-fruit?), and through them to the Arabs, being the *jouz-al-teeb* or fragrant nut of Avicenna. The Dutch long endeavoured to confine the Nutmeg to three of the small Banda Islands. But when these were in possession of the English from 1796 to 1802, Dr Roxburgh brought away and introduced numerous plants into the English settlements of Bencoolen and Penang, and into the Calcutta Botanic Garden. The Nutmeg has also been introduced into the Mauritius, French Guiana, and West Indian Islands. It is now grown extensively at Singapore. Nutmeg and Clove-trees have both flowered at Syon House.

The Nutmeg-tree (fig. 91) is about 25 to 30 feet high, with some resemblance to a Pear-tree. Leaves faintly aromatic, alternate, sub-bifarious, with short petioles, oblong, somewhat obtuse at the base, acuminate, glabrous, above dark green, paler beneath. *Male.* Racemes axillary. Flowers small, yellowish, the pedicles of each supported by a minute bract. Calyx (1) urceolate, 3-toothed, thick and fleshy, with short reddish pubescence. Filaments (1 and 2) united into a thick, oblong, and obtuse column. Anthers (2) about 9 (9 pairs, *Roxb.*), linear-oblong, attached round the upper part of the filamentous column, 2-celled, free at their base, opening longitudinally (3). *Female* (4). Peduncles usually solitary axillary. Perianth much as in the male. Ovary ovate. Style short. Stigma 2-lobed, persistent. Fruit pyriform or nearly spherical, about the size of a peach. Pericarp fleshy, splitting from the apex into two equal, thick, fleshy, astringent valves, and displaying the deep-orange or scarlet-coloured *arillus* or *Mace* which, cut into many irregular denticulate stripes, embraces the nut so tightly as to impress it with superficial furrows. Nut (5) ovoid, attached by a large umbilicus to the bottom of the cell; its shell is hard, of a dark brownish-black colour, and glossy, with its inner coat of a light-brown colour, thin, but spongy, closely investing the seed. *Seeds* or *Nutmegs*

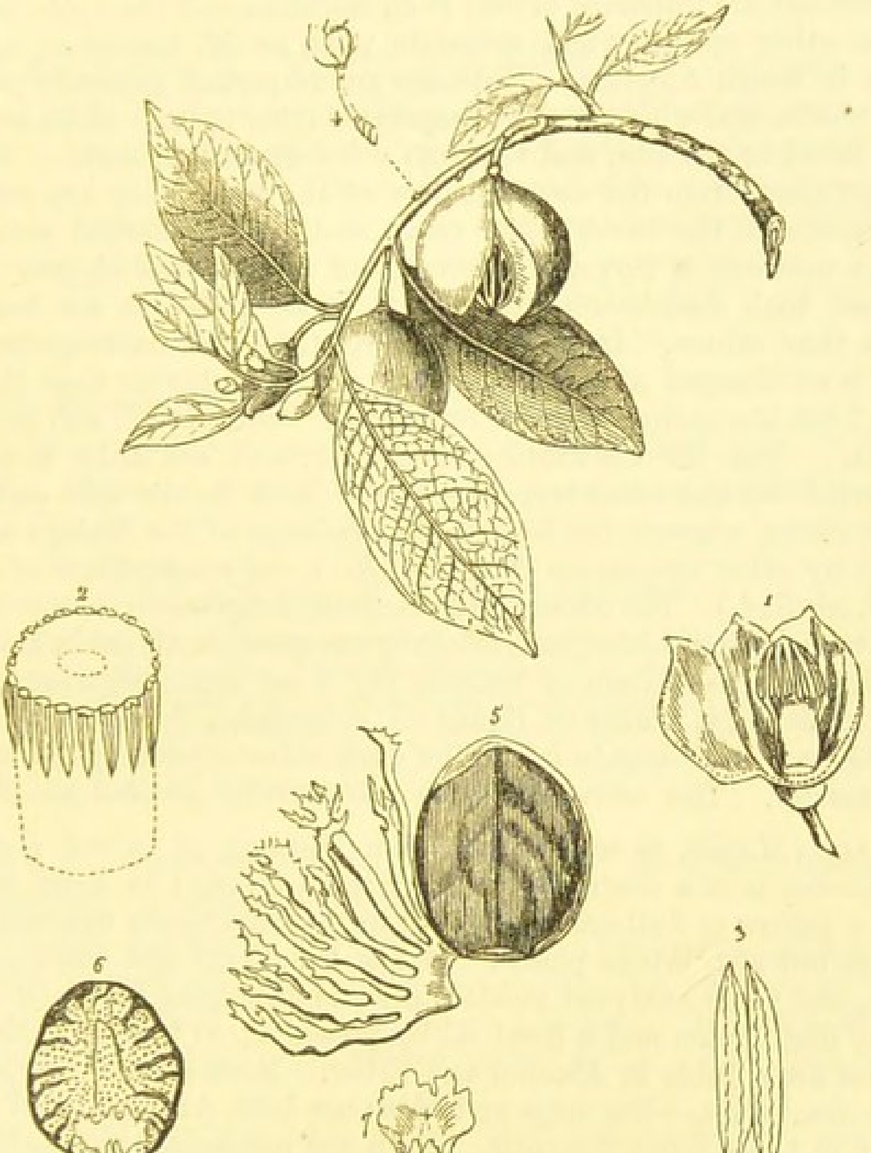

Fig. 91.

conform to the shell, and consists chiefly of albumen, into which the inner coat of the shell dips deeply, giving it a variegated, brownish-veined, or *ruminated* appearance (6); while fresh, they are rather soft, juicy, and more fragrant than after being dried. Embryo at base of albumen (6), erect, patelliform. Cotyledons 2, thick, fan-shaped, margins irregularly cut (7). Plumule of 2 unequal lobes. Radicle inferior, hemispherical.—Roxburgh chiefly; Fl. Ind. iii. p. 844; Corom. Plant. iii. t. 267; Nees von E. 133; St. and Ch. 104.

At Bencoolen the tree generally fruits at the age of 7 years, and continues productive for a long period. The trees being monœcious and diœcious, a large number turn out barren when they are raised from seed.

Nutmegs are imported chiefly from Sumatra and the Spice Islands. A few other species yield aromatic nuts, as *M. tomentosa*, and *M. Otoba* in South America. Nutmegs are imported generally without their shells, and with the *Mace* separated from them. Both are carefully dried in the sun, and the nuts often dipped in milk of lime to protect them from the depredations of insects. They are roundish or ellipsoidal, the finest rather small and heavy, marked externally with a network of furrows, internally of a light reddish-grey colour, marked with darker-coloured veins. Some nutmegs are longer in shape than others. In the English tariff the round nutmegs imported have been charged at a rate of duty six times higher than the long ones, from the notion that the former are "cultivated" and the latter "wild." But Mr Crawford states that both are alike in quality, produced by the same tree, and found both in the wild and cultivated states, whereas the long *Wild Nutmegs* of the Malays are produced by other species (as *M. fatua*, &c.), and are destitute of aroma. (P. J. xi. 514.) The odour of the Nutmeg is agreeably aromatic; the taste warm, a little bitter, but gratefully pungent. Analysed by Bonastre, it was found to contain of Volatile Oil 6 per cent., Stearine or solid fatty matter 24, Elaine or liquid oil, coloured, 7·6, Acid 0·8, Starch 2·4, Gum 1, and Lignin 54. The dark veins especially contain the oily matter. The active parts are taken up by Alcohol and Ether.

MACE (*Macis*), as seen in the fresh Nutmeg, or in wet preserved specimens, is of a deep orange or crimson colour; in a dry state, it is of a yellow or dull-orange colour; in flat, irregularly cut, somewhat horny, but also brittle pieces. It has the odour and taste of Nutmegs, and when analysed yields the same principles, that is, a volatile oil by distillation and a fixed oil by pressure; so that its active properties are soluble in Alcohol and Ether. Mace is not officinal.

Action. Uses.—Nutmegs and Mace are both Aromatic and Stimulant; in large doses Narcotic. Both are employed as Condiments, but Nutmegs are used as an adjunct to many officinal preparations.

Pharm. Prep.—Pulvis Cretæ Aromaticus, Pulv. Catechu Co., Tinct. Lavandulæ Co., Spiritus Armoraciæ Co.

OLEUM, MYRISTICÆ EXPRESSUM, B. A concrete oil, obtained by means of expression and heat from Nutmegs. *Butter of Nutmegs*, commonly but erroneously called *Expressed Oil of Mace.*

Butter of Nutmegs is an ingredient of the Emp. Picis, B., otherwise it is little used. It is imported from the Moluccas, being prepared there by partially heating and subjecting Nutmegs to pressure. It is solid, in brick-shaped cakes, of an orange colour, with the odour of Nutmegs. It contains a little Volatile Oil, a fluid Elaine; and another fatty principle, which is solid and crystallisable, melts at 118°, and contains *Myristic acid* ($C_{28} H_{27} O_3 + H O$) in combination with Glycerine. It is soluble in twice its weight of Ether, four times its weight of boiling Alcohol.

Action. Uses.—Emollient and slightly Stimulant as an Embrocation.

OLEUM MYRISTICÆ, B. Volatile or Essential Oil of Nutmegs.

Obtained in England by distilling with water *Nutmegs* reduced to powder. Usually of a pale yellow colour, with the odour and taste of Nutmegs. Sp. Gr. ·920–·948. This, after a time, deposits crystals of Stearoptene, the Myristicine of some authors. The true Volatile Oil of Mace is similar in nature and properties.

Action. Uses.—Stimulant in doses of ♏j.–♏iij.

Pharm. Prep.—Spiritus Ammoniæ Aromaticus.

SPIRITUS MYRISTICÆ, B. Spirit of Nutmeg.

Prep.—B. As Spiritus Lavandulæ (⅛ the strength of 1864).

Action. Uses.—Aromatic Stimulant. Used as an adjunct in doses of f℥ß–f℥j.

LAURINEÆ, *R. Brown.* Laurels.

The Laurineæ, from the structure of their anthers, are allied to *Atherospermeæ* and to *Gyrocarpeæ:* from the *Thymeleæ* they are easily distinguished by their structure. They have been well elucidated by Nees von Esenbeck. In their red-coloured juice and *aromatic* properties they resemble *Myristiceæ.* Tropical regions of Asia and America, with two species extending to the north of Africa and south of Europe.—*Enneand. Monog.* Linn.

[LAURUS, L. Laurus nobilis, *Linn.* Fructus, the Fruit. Laurel or Sweet Bay. *Enneandria Monog.* Linn.

This is the Δάφνη of the Greeks. From its leaves having been employed in making chaplets for their gods and crowns for their heroes, it was called *Laurus nobilis* by Linnæus. It is the *ghar* of the Arabs, and probably the *Ezrach* of the Bible. (*See* Bibl. Cycl. i. p. 692.)

Evergreen (fig. 92) from 15 to 25 feet high, with dense leafy branches. Leaves oblong, lanceolate, acute, wavy at the margin, hairless, with the exception of a fine beard and small pore at the axils of the lower veins. Umbels 4–6 flowered (1), axillary, supported by scarious concave scales. Flowers diœcious, yellowish, dotted with fine glands. Perianth 4-parted (2). Fertile stamens 12 in 3 rows, the external alternating with the segments of the perianth. Filaments each with 2 glands at or above the middle. Anthers oblong, 2-celled, all looking inwards, opening with 2 turned-up valves (3). Female flowers with 2 to 4 castrated stamens. Stigma capitate. Berry ovoid, about the size of a field-bean, bluish-black, single-seeded. Cotyledons large, oleaginous, convex on the back. North of Asia Minor; common in Mediterranean region; shrubberies in England.—Nees von E. t. 132.

Lauri Folia.—Laurel leaves are not now officinal. They must be carefully distinguished from the poisonous leaves of the Cherry Laurel, p. 438. They have a fragrant odour, and an aromatic, rather bitter taste. These properties they owe chiefly to the presence of a yellow-coloured Volatile Oil, which may be separated by distillation with water.

Lauri Fructus, L.—Laurel Berries (*hab al ghar* of the Arabs) are oblong, ellipsoid; when dry, of a dark-brown colour, with a wrinkled, friable sarcocarp, covering the two oval fatty cotyledons. They contain a warm, fragrant Volatile Oil, which may be obtained by distillation with water, and about ¼ of a greenish-coloured fat, which may be separated by expression.

Fig. 92.

Oleum Lauri expressum, or Oil of Bays, is obtained by pressure, with the aid of heat, both from the fresh and the dry drupes of the Bay tree. It is imported from the south of Europe. Like the Butter of Nutmegs, it contains a Volatile Oil, Elaine, and Stearine.

Action. Uses.—Aromatic Stimulants, but not much used now. The infusion of the leaves is Diaphoretic. Oil of Bay may be used as a stimulant Embrocation.

Pharm. Prep.—Confectio Rutæ, L.]

SASSAFRAS RADIX, B. Sassafras officinale, *Nees.* The dried Root. (From North America.)

Sassafras was discovered by the Spaniards in Florida in 1528, but is common throughout the United States. The name is considered to be a corruption of Saxifrage (*De Theis*). Sassafras nuts have nothing to do with this plant, but are probably the fruits of a Nectandra.

A small diœcious tree, but growing to a great height in favourable situations, with a trunk about a foot in diameter. Bark rough, furrowed, greyish-coloured, but the twigs smooth, and bright-green. Leaves alternate, petiolate, downy when young, membranous, varying much in form and size, some being oval and entire, others with a lobe on one side only, the generality 3-lobed, but all tapering into the petiole. Flowers slightly fragrant, of a pale yellowish-green colour, racemose, with deciduous subulate bracts. Perianth 6-parted. Stamens 9, the 3 inner with a thick stipitate gland on each side. Anthers linear, 4-celled, all looking inwards. Female flowers usually with fewer sterile stamens, the inner often all united together. Drupe oval, about the size of a large pea, of a deep blue colour, placed on the thickened apex of the reddish-coloured peduncle, surrounded by the cup formed by the remains of the perianth. North American woods from Canada to Florida. Flowers in May in the north, but earlier in the south.—Nees von E. 131; St. and Ch. 126.

Sassafras Wood is light, porous, and fragile, whitish in the young, and reddish in the old tree, but feebly aromatic, and seldom employed in America. The bark is sometimes separated.

The *Root* is more efficacious, and is usually seen in irregular and branched fragments, sometimes 8 inches in diameter at the crown; wood of a brownish-white, light and porous; bark brittle, spongy, in layers of a rusty cinnamon hue; fresh exposed surfaces of a lighter colour; sometimes covered with a brownish epidermis. Dr Reinach has analysed the *Bark of the Root* of the Sassafras, in which he found, as was to be expected, a much larger proportion of the active principle than in the Wood. He found of Heavy and Volatile Oils ·8, Fatty matter ·8, Resin and Wax 5, *Sassafrid* (a peculiar principle) 9·2, Tannin 5·8, Sassafrid with Tannin and Gum 6·8, Albumen ·6, Gum, Colouring matters, &c. 3, Starch with reddish-brown Colouring matter 5·4, Starch with Tannin, &c. 28·9, Lignin, 24·7 = 100 parts.

The odour is pleasantly fragrant, its taste sweetish and gratefully aromatic, dependent on the presence of a Volatile Oil. The properties are yielded to hot water as well as to Alcohol; but the Volatile Oil will necessarily be dissipated, if much heat is employed.

Sassafras Pith is described by American writers as in slender, very light, and spongy pieces; mucilaginous in taste, with a slight flavour of the Sassafras; forming a limpid mucilage with water, which is much used as a demulcent. The leaves are said by Dr Lindley to be used in Louisiana for thickening soup, from containing much mucilage.

Action. Uses.—Stimulant; Diaphoretic in infusion; but chiefly used in combination.

Pharm. Prep.—Decoct. Sarsæ Comp., B.

OLEUM SASSAFRAS. Volatile Oil of Sassafras.

Prep.—Distil bruised Sassafras Root, wood, and bark, with water.

A light yellow-coloured Oil; Sp. Gr. 1·094; with Sassafras-odour and pungent taste. It appears to be composed of two oils, one of which swims, the other sinks in water. After a time it deposits a Stearoptene. It is converted by the action of Chlorine into a thick tenacious mass, which, after neutralisation with lime, affords on distillation a small quantity of true Camphor.

Action. Uses.—Warm Stimulant in doses of ♏ij.–♏v.

CAMPHORA, B. Camphora officinarum, *Nees.* Concrete Volatile Oil, obtained from the wood by sublimation. Camphor. (From China and Japan.)

Camphor is a principle found in many plants, but only in two in any great abundance. One of these, (Dryobalanops,) which yields none of the Camphor of European commerce, has been mentioned at p. 340. The other is a Chinese and Japanese plant. Camphor, like several substances the produce of countries to the southward or eastward of India, was unknown to the ancients. (Hindoo Med. p. 93.) It was known to the Arabs, and called by them *Kaphoor.*

The Camphor tree is an evergreen, grows to a considerable size, is straight below and branched. All parts emit a camphoraceous odour when bruised. Wood white, fragrant, much used in China for making trunks, boxes, &c. Branches somewhat lax, smooth, with a greenish bark. Leaves alternate, with long petioles, ovate-lanceolate, rather coriaceous, smooth, shining, and bright-green above, paler beneath, triple-nerved, with a sunken gland opening by a pore beneath, at the axils of the principal lateral veins. Leaf-buds scaly. Flowers small, hermaphrodite, smooth externally, in naked, axillary, and terminal corymbose panicles. Perianth 6-cleft, with a deciduous limb. Fertile stamens 9, in 3 rows, the 3 inner supported at the base by 2 stipitate compressed glands. Anthers 4-celled, opening by as many ascending valves, the 3 interior looking outwards, the others opening inwards. Three sterile stamens subalternate with those of the second row, three others stipitate, each with an ovate head. Drupe situated in the truncate cup-like base of the perianth.—Native of China, principally near Chinchew in the province of Fokien; also of Formosa and Japan.—Nees von Esenb. 130; St. and Ch. 129.

Camphor is diffused through all parts of the plant, and is separated from the root, trunk, and branches, which being cut into chips, are first boiled in water, and then sublimed into inverted straw cones contained within earthen capitals. It is thus obtained in the form of *Crude Camphor*, chiefly from the province of Fokien in China and the opposite island of Formosa, but some of good quality is also procured from Japan. The Dutch exported from thence into Europe 310,520℔ in seven years. It is sometimes imported into this country from Batavia. The ordinary Crude Camphor is in small greyish-coloured, slightly sparkling grains, which by aggregation form greyish crumbling cakes, with all the properties of purified

Camphor. This is separated from impurities by being mixed with Lime and sublimed into thin glass vessels of a certain shape, which being afterwards cracked, the Camphor is obtained in a bell-shaped, concavo-convex cake about three inches thick with a hole in its middle.

Camphor is solid, colourless, and translucent, with a crystalline texture; has a strong, penetrating, aromatic odour, and a bitter, rather pungent taste, followed by a sensation of coolness; though brittle, it is not, from its toughness, easily pulverised. Sp. Gr. ·98 to ·99; so that it floats on water, and, evaporating while doing so, undergoes a curious rotatory movement. From its volatility, it evaporates slowly at ordinary temperatures, and crystallises on the inside of bottles. It melts at 288°, boils at 400°, burns with a bright flame; is little soluble in water, but easily so in Alcohol, Ether, the volatile and fixed Oils, in Acetic acid, and the dilute mineral acids, in water charged with Carbonic acid, and with the aid of trituration in about 8 times its weight of Milk. Nitric Ether f℥ij. will retain Camphor gr. xx. dissolved in f℥iv. of water. (*c.*) Camphor is considered to be an oxide of *Camphogen* ($C_{10}H_8$), or a solid volatile oil composed of $C_{10}H_8O$. The B. P. gives as a test of its purity: "It sublimes entirely when heated." By long heating with Nit. acid, Camphor is oxidised and converted into *Camphoric acid.*

Borneo Camphor is in white crystalline fragments, as found in the wood of the *Dryobalanops Camphora.* Sp. Gr. 1·009. Its odour is not of so diffusible a nature, otherwise it closely resembles the above. The Liquid Camphor of the same tree seems to be of the nature of Camphogen. Dr A. T. Thomson, by passing a current of Oxygen gas through it, converted it into Camphor.

Artificial Camphor, or *Hydrochlorate of Turpentine* ($C_{20}H_{16}$, HCl), remarkably resembles true Camphor in its external properties. It is formed by acting upon Oil of Turpentine with HCl. It differs from true Camphor in burning with a sooty flame, and in giving off when heated the odour of Turpentine. Mr Bailey adds the following test:—If a fragment be placed on a microscope-slide, and a drop of alcohol added, it will first dissolve, and re-crystallise as the spirit evaporates. Examining this with the aid of polarised light, the small crystals of true Camphor will seem as if beautifully coloured; but not so those of the artificial product.

Action. Uses.—The action of Camphor is variously described. Applied locally for a time to any delicate surface, it will act as an irritant. Its action, when taken internally, is chiefly on the nervous system. In moderate doses it will exhilarate, allay nervous irritation, and produce quietude and placidity of feeling. Being absorbed into the system, in larger doses, or in particular constitutions, the circulation may be affected by it in a similar way. It afterwards passes off by the skin and bronchial membranes, but not by the urine; the pulse is increased in fulness, and diaphoresis produced, especially if the patient be covered over; consequent relief of febrile symptoms ensues. Sedative effects may succeed to these symptoms. In large doses it acts as a Narcotic, and might be poisonous. It is chiefly useful as a Calmative and Anodyne in various Nervous, especially Hysterical affections, and in Nervous and Typhoid fevers, in doses of gr. v.–gr. x.

Aqua Camphoræ, B. Camphor Water. Camphor Mixture.

Prep.—B. Take of *Camphor*, broken into pieces, ℥ß; *Distilled water*, Cj. Enclose the Camphor in a muslin bag, and attach this to one end of a glass rod, by means of which it may be kept at the bottom of a bottle containing the distilled water, the other end of the rod terminating just below the stopper of the bottle. Having thus put the Camphor into the water, close the mouth of the bottle, macerate for at least two days, and then pour off the solution when it is required. (The Camphor would float, unless held to the bottom by some such contrivance.)

(Similar to the Camphor Mixture of the L. P., but the Lond. College ordered the Camphor to be triturated with one-third part of rect. Spirit before mixing with the water. By the aid of Magnesia a larger quantity of Camphor may be dissolved.)

Action. Uses.—The Camphor Water of the B. P. is feeble, but has the odour of Camphor, and is a grateful vehicle for more powerful medicines, in many Nervous affections, in doses of f℥ij.–f℥iij.

Spiritus Camphoræ, B. Spirit of Camphor.

Prep.—B. Dissolve Camphor ℥j. in *Rectified Spirit* ℥ix.

Action. Uses.—For external use, Stimulant and Anodyne. With the aid of Sugar to suspend the Camphor in water, it may be given internally in doses of ♏x.–♏xxx.

Tinctura Camphoræ Composita, B. Tinctura Camphoræ cum Opio, B. 1864. Paregoric. (*See* p. 318.)

Paregoric contains Opium, gr. j. in f℥ß.

Dose.—fʒß–fʒiv.

Linimentum Camphoræ, B.

Prep.—B. Dissolve *Camphor* ℥j. in *Olive Oil* ℥iv. (Same as L. prep.)

Action. Uses.—Externally as a Stimulant and Anodyne. Commonly called Camphorated Oil. Camphor is also an ingredient of Soap Liniment, and thus of many other Liniments of the B. P. (p. 549.)

Linimentum Camphoræ Compositum, B. Compound Camphor Liniment.

Prep.—B. Dissolve *Camphor* ℥ijß, and *Oil of Lavender* fʒj. in *Sp. Rect.* f℥xv., add *Liq. Ammon. fort.* f℥v., and shake together until mixed.

Action. Uses.—Rubefacient and Stimulant for external use.

Cinnamomi Cortex, B. Cinnamomum Zeylanicum, *Breyn.* The inner bark of shoots from the truncated stock. (From Ceylon.) Cinnamon. *True Cinnamon* of the shops.

Cinnamon is the *Kinnemon* of Exod. xxx. 23 (*see* Bibl. Cycl. ii. p. 210), and the κιννάμωμον of Herodotus, a name which he states the Greeks learnt from the Phœnicians. The name seems derived from the Cingalese *Cacynnama* (dulce lignum), or the Malay *Kaimanis*, which Mr Marshall says is sometimes pronounced *Kainamanis.* (See *Antiq. of Hind. Med.* 84 and 141.)

The Cinnamon tree of Ceylon (fig. 93) is about 30 feet high. The root has the odour of Cinnamon as well as that of Camphor, and yields this principle upon distillation. The twigs are somewhat four-cornered, smooth, shining, and free from any downiness. The leaves are liable to variation, being ovate, or ovate-oblong, terminating in an obtuse point, triple or 3-nerved, that is, there are three principal nerves, which sometimes remain separate to the very base, but usually approach each other a little above the base, though without uniting; there are, moreover, in many cases two shorter nerves external to these. Leaves reticulated on the under side, smooth, shining, the uppermost the smallest, with a good deal of the taste of cloves. The leaf-buds are naked. Panicles terminal and axillary. Flowers usually bisexual, rather silky. Perianth 6-cleft (2), segments oblong, the upper part deciduous. Fertile stamens 9, in 3 rows, the 3 inner with 2 sessile glands at the base (6). Anthers ovate, 4-celled (4–6), the 3 interior opening outwards, 3 abortive capitate stamens (staminodia) in the interior of all. Ovary 1-celled, with a single ovule. Stigma disk-like. Drupe (or berry) 1-seeded, seated in the cup-like 6-lobed base of the perianth (7). Seed large, with large oily cotyledons (8–10); embryo above.—Native of Ceylon, now cultivated elsewhere, as on the Malabar coast, in Java, Cayenne, &c.—Nees von E. as Larus Cinnamomum, 128; St. and Ch. 121.

Cinnamon is cultivated in plantations situated on the south-west of the Island of Ceylon, between Negombo and Matura, where the soil is nearly a pure quartzose sand, the climate damp, showers frequent, and the temperature high and equable. (*Dr Davy.*) Trees may be cut when six or seven years old. Branches three years old, or those which are from half an inch to three inches in diameter, are selected and lopped off, commencing in May and continuing till October. The bark is divided by longitudinal incisions,—of which two opposite to each other are made in the smaller shoots, several in the larger,—and then peeled off in strips. After twenty-four hours, the epidermis and the green matter under it are scraped off, after the strips of bark have been placed on a convex piece of wood. The bark soon contracts into the form of quills, which are about forty inches in length, of which the smaller are introduced within the larger ones, forming the ordinary rolls of Cinnamon. They are dried first in the shade and then in the sun, and sorted into Cinnamon of different qualities, known in commerce as first, second, and third Cinnamon. It is imported chiefly from Ceylon; some also from Tellicherry on the Malabar coast, probably grown at Anjarakandy. (*See* p. 417, and Buchanan's Mysore, p. 546.) Some is also exported from other parts of the Madras Presidency, where it was long since introduced by Dr Anderson, and grown at Tinnivelly, &c. (*see* Roxb. Fl. Ind. ii. p. 296). It has been exported from Quilon. (See *Cassia.*)

Besides Cinnamon, Oil of Cinnamon is made at the plantations; and from the ripe fruits a fatty substance called *Cinnamon Suet* is expressed, which Dr Royle supposes to be the *Comacum* of Theophrastus. (*Antiq. of Hind. Med.* p. 546.) He finds it noted in Rheede, *Hort. Mal.* i. p. 110.

Ceylon Cinnamon of the best quality is in long and slender cylindrical bundles, about forty inches in length, composed of numerous quills rolled up within one another, each about the thickness of cartridge-paper, smooth, pliable, breaking readily with a splintery fracture, and easily powdered. The colour of the bark is a dull, yellowish-brown, now usually called a Cinnamon colour. The surface is intersected by pale glistening fibrils. It has a pleasant, grateful odour, a warm, sweetish, and very agreeable taste. Besides the three qualities of Ceylon Cinnamon, it is also imported of different qualities from the Malabar Coast; and Dr Wight has ascertained that the Cassia of the India Peninsula is sometimes exported as Cinnamon. But the Cinnamon plant itself has been introduced into so many places, that small quantities are occasionally imported from them, as, for instance, from Cayenne. Some of these are employed for adulterating the superior and more expensive Ceylon Cinnamon. The inferior

Fig. 93.

kinds are thicker, less grateful, and more resembling Cassia. Analysed, Cinnamon is found to contain Volatile Oil (about 6 parts in 1000), Tannin (of the nature of Catechu Tannin), Mucilage, Resin, Colouring matter, Cinnamic acid, and Ligneous fibre.

Action. Uses.—Aromatic and Stomachic, slightly Astringent. It is the type of Aromatics, the most grateful of condiments; much used as an ingredient of chocolate. The powder in doses of gr. v.–gr. xx. will check Nausea, relieve Flatulence and Cramps. Much employed in combination in Diarrhœas; in low states of the constition; and as a constituent of various preparations.

Pharm. Prep.—Infusum Catechu. Decoct. Hæmatoxyli. Pulvis Aromaticus. Pulv. Cretæ Arom. Pulv. Kino cum Opio. Tinctura Catechu. Tinct. Cardamomi Comp. Tinct. Lavand. Comp. Sp. Ammoniæ Arom. Acid. Sulphuric. Arom.

PULVIS CINNAMOMI COMPOSITUS, B. Aromatic Powder. Compound Cinnamon Powder.

Prep.—B. Take of *Cinnamon Bark*, in powder, *Cardamom Seeds*, in powder, and *Ginger*, in powder, of each ℥j. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.

(The L. powder contained also Long Pepper.)

Action. Uses.—Aromatic Stimulant in doses of gr. v.–gr. xx.

With about 1 part in 4 of Chalk, and aromatics, Cinnamon forms the Pulv. Cretæ Aromaticus, and this, with 1 part in 40 of Opium, the Pulv. Cretæ Arom. c. Opio, both used in Diarrhœas.

OLEUM CINNAMOMI, B. Oil of Cinnamon.

This Oil is imported from Ceylon, being obtained by macerating the powdered rejected bark in a saturated solution of salt, and then distilling. The water which passes over is milky, from holding the Oil in suspension; but this soon separates. About 8 ounces are obtained from 80℔ of recently prepared Cinnamon. Some of it is heavier and some lighter than water.

Cherry-red when old, wine-yellow when recent; odour purely cinnamonic. It sinks in water. Nitric′ (concentrated, added drop by drop) converts it into a crystalline mass (a compound of the acid and the oil). The colour varies according to age. Oil of Cassia is often substituted for it; other adulterations are used, which the Nitric′ detects by producing a less distinct effect. Oil of Cinnamon is remarkable for its grateful aroma and spicy cinnamonic taste, less pungent and acrid than that of Oil of Cassia. The essential part of Oil of Cinnamon is a limpid fragrant compound called *Hydruret of Cinnamule* ($C_{18} H_7 O_2 + H$). But by exposure to the air this combines with oxygen, and produces *Cinnamic acid* ($C_{18} H_7 O_3$) and two peculiar resins. Cinnamic acid consists of Cinnamule + O. It may also be obtained by distilling the Balsams of Tolu and of Peru. By powerful oxidising agents this acid may be converted first into Bitter Almond Oil, and then into Benzoic acid. (P. J. iv. 264.) Strecker has lately produced Oil of Cinnamon artificially, by the oxidation of

Styrone, a substance obtained by the action of Caustic Potash on liquid Storax.

An Oil distilled from the leaves of Cinnamon is sometimes exported to Europe, and sold under the name of *Oil of Cloves.*

Action. Uses.—A grateful but powerful Stimulant in does of ♏j.–♏iij. Much used for flavouring by cooks and confectioners.

AQUA CINNAMOMI, B. Cinnamon Water.

Prep.—As Aq. Anethi.

Action. Uses.—Carminative, but chiefly used as a vehicle in doses of f℥jß–f℥iij. It is made with greater facility with the Oil, and is sometimes prepared by diffusing the Oil through water by means of Sugar or Magnesia. But as Cinnamon water made from the Oil is much more apt to spoil, from the formation of Cinnamic acid, distillation from the bark is the preferable method.

TINCTURA CINNAMOMI, B. Tincture of Cinnamon.

Prep.—B. Take *Cinnamon*, in coarse powder, ℥ijß, *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Grateful adjunct (fʒj.–fʒiv.) to draughts.

[TINCTURA CINNAMOMI COMPOSITA, L. Compound Tincture of Cinnamon.

Prep.—L. Macerate for seven days *Bruised Cinnamon* ℥j., *Bruised Cardamoms* ℥ß, *Long Pepper* ground ʒijß, *Rasped Ginger* ʒijß, in *Proof Spirit* Oij. Filter.

Action. Uses.—Aromatic adjunct to Astringent and other draughts, in doses of fʒj.–fʒij.]

CASSIÆ CORTEX. Bark of Cinnamomum aromaticum, *Nees*, and of other species. Cassia Bark. *Spurious Cinnamon.*

Cassia is mentioned by early Greek writers; in the Bible by the name *Kiddah*, (κιττώ is one kind of Cassia in Diosc. i. c. 12.) It is translated Cassia in Exod. xxx. 24 (*See* Kiddah, and Kinnamon, *Bibl. Cycl.*, and *Antiq. of Hind. Med.* p. 84).

Cassia Bark, called also *Cassia lignea*, is imported from China, and from the Malabar coast of India, as was shown at length by Dr Royle in the first addition of this work. The Chinese Cassia is produced by *Cinnamomum aromaticum.* Cassia buds, which are aromatic, and have some resemblance to cloves, are exported from China, and yielded by the same plant.

CINNAMOMUM AROMATICUM, *Nees v. Esenb.* A tree of considerable size. There is one 18 feet high in the Edin. Bot. Garden. Branches angular, twigs and petioles covered with down. Leaves often nearly opposite, though usually alternate, oblong-lanceolate, acute at each end, triple-nerved, or with three nerves which unite into a single nerve above the insertion of the leaf-stalk, and disappear towards the apex of the leaf; the nerves are, like the twigs, covered with broken (strigulose) downiness, with curved veinlets on the under surface. Panicles narrow, silky.—This is the *C. Cassia* of Blume, introduced from China, and the *Laurus Cassia*, t. 3, of the brothers Nees in their paper on the Cinnamon, also of Hort. Kewensis, ii. p. 427, and the Laurus Cinnamomum of

Andrew's Repos. t. 595, often quoted 596. The leaves taste mucilaginous and Cinnamonic. (*c*) Dr Lindley says that as grown in stoves they are almost insipid, mucilaginous, and somewhat astringent. We have received a specimen of this plant (named *Cinnamomum chinense*) from the Messrs Loddiges, who inform us that it was imported by their house from China in 1790. This is probably the source of the various plants in hot-houses. The leaves taste mucilaginous, but also aromatic.

Cassia, though it bears a considerable resemblance to Cinnamon, is usually in single quills, seldom more than double, from ¼ to ½ or even 1 inch in diameter. It is thicker, rougher, more dense, breaks with a shorter fracture, and is of a darker red colour than Cinnamon, and its powder of a reddish-brown tint. Its taste is more pungent and stronger, but not so sweet and grateful as that of the *true* Cinnamon, and its odour is less agreeable. That from China is now always stripped of its epidermis.

That Cassia cannot consist merely of inferior kinds of Ceylon Cinnamon, as has been supposed by some, is sufficiently proved by the fact that the latter has, until recently, paid an export duty of 3s. a pound, whereas Cassia, even in England, is barely worth 1s. a pound.

Some true Cinnamon is certainly exported from the Malabar coast of India. Dr Wight states that he has found among the specimens furnished to him from thence the true Cinnamon-tree (*C. Zeylanicum*). He considers that all sorts of Cinnamon-like plants, yielding bark of a quality unfit to bear the designation of Cinnamon, are passed off as Cassia. Mr Huxham, of Quilon, also states, that the only difference between Malabar Cassia and Malabar Cinnamon is, that the former is coarser and thicker than the latter. Both are obtained from the same tree, the Cassia being the bark of the larger parts of the tree, and the Cinnamon being peeled from the younger shoots and small branches.

A kind of Cassia called *Cortex Malabathri*, *Mother-Cinnamon*, also *Wild Cassia*, for some time almost unknown, has been lately imported in considerable quantities from Calcutta, Singapore, and Java. The pieces are thicker, flatter, and wider than those of common Cassia, and yield a more mucilaginous decoction. Martiny states that it is produced by *Cinnamomum Tamola*, Nees v. E., a native of Bengal and Java.

Cassia lignea, analysed by Bucholz, yielded of Volatile Oil 0·8, Resin 4·0, Gummy Extractive 14·6, Bassorin with Ligneous fibre 64·3, water and loss 16·3 = 100. But as Sesquichloride of Iron and Gelatine both produce precipitates with it, that of the former of a dark-green colour, it must also contain Tannin. Its active properties, dependent chiefly on the volatile oil, are taken up by Spirit, and partially by water, as in the preparations formerly used.

Action. Uses.—Aromatic Stimulant, in doses of gr. x.–gr. xxx.

OLEUM CASSIÆ. Oil of Cassia.

The Volatile Oil of Cassia-bark, obtained by distillation with water, is imported from Singapore, and is still probably all produced by the Chinese Cassia or Cinnamon, *C. aromaticum.*

Cassia Oil, when pure, has a pale wine-yellow colour, which does not deepen with age. (*c.*) Sp. Gr. 1·095. It has in a remarkable degree the Cassia odour and taste. Like Oil of Cinnamon, it absorbs Oxygen, and is converted into Cinnamic acid. Nit′ also converts it into a mass of crystals, in which the oil appears to be combined with the acid. It appears in all essentials to resemble the Oil of Cinnamon, and though not so grateful, is often sold for Oil of Cinnamon.

Action. Uses.—Stimulant Carminative in doses of ♏j.–♏v.

NECTANDRA RODIEI, *Schomburgk.* Greenheart-tree. The Bark. *Bebeeru-bark.*

A considerable quantity of a wood called Greenheart is imported into this country for ship-building from Guiana and the West Indian islands. It is large in size, heavy, hard, durable, takes a polish, but is apt to split, and is of different tints of olive-green, varying from pale to dark.

Sir R. Schomburgk (Hooker's Journ. of Bot., Dec. 1844) has described the tree which yields this timber. It is a new species of the Laurels, belonging to the genus *Nectandra*, and has been named *N. Rodiei.* In 1834 attention was first directed to the bark of this tree as possessing valuable febrifuge properties.

The bark of the Bebeeru tree occurs in large flat pieces, is about four lines in thickness, heavy, and with a rough fibrous fracture, of a dark cinnamon-brown colour, rather smooth within, but covered externally by a splintering greyish-brown epidermis. It has little or no aroma, but a strong, persistent, bitter taste, with considerable astringency. It contains, in addition to Tannic acid, a peculiar bitter alkaloid, the presence of which was first indicated by Mr Rodie, R.N., in compliment to whom the tree was named. It was afterwards described at length by Dr Maclagan, and may be prepared in the same way as Quinia from Cinchona bark.

Pure *Beberia* does not crystallise. It is very soluble in Alcohol, less so in Ether, and very sparingly in water. Heated, it fuses, and the heat being continued, it swells up, giving off vapours of a strong peculiar odour, and burning without residue. Subjected to the action of oxidising agents, it gives with Bichromate of Potash and Sul′ a black, and with Nit′ a yellow Resin. It forms with acids, salts which are all uncrystallisable; with Perchloride of Gold, Mercury, Copper, Iron, and Platinum, it gives precipitates which are soluble to a certain extent in hot water and Alcohol, but which, on the solution cooling, are not deposited from it in a crystalline form. Messrs Maclagan and Tilley obtained for it the formula $C_{35} H_{40} NO_6$.

Dr M. obtained Beberia from Warburg's Fever Drops. But there has since appeared reason to suppose that this secret nostrum often, if not always, contains Quinine.

The above authors observe as remarkable that this alkaloid should be isomeric with Morphia, which acts as a pure narcotic. The atomic constitution of Morphia, calculated by Liebig and Regnault from their analyses, agrees with that given above for Beberia. But it should be observed, that Dr Planta has since analysed Beberia again, and calculated for it a different formula, viz., $C_{38} H_{21} N O_6$. The confirmation of this equivalent would entirely destroy the supposed isomerism.

BEBERIÆ SULPHAS, B. Sulphate of Beberia (or *Bibirina*). The Sulphate of an alkaloid prepared from Bebeeru bark.

A formula for the preparation of the Sulphate of Beberia from the bark is given in the B. P.

Prep.—B. Take of *Bebeeru Bark*, in coarse powder, ℔j.; *Sulphuric Acid*, f℥ß; *Slaked Lime*, ℥¾, or a sufficiency; *Solution of Ammonia*, a sufficiency; *Rectified Spirit*, f℥xvj., or a sufficiency; *Dilute Sulphuric Acid*, a sufficiency; *Water* Cj.; *Distilled water*, a sufficiency. Add the Sulphuric Acid to the water; pour upon the Bebeeru Bark enough of this mixture to moisten it thoroughly; let it macerate for twenty-four hours; place it in a percolator; and pass through it the remainder of the acidulated water. Concentrate the acid liquor to the bulk of one pint, cool, and add gradually the Lime in the form of milk of lime, agitating well, and taking care that the fluid still retains a distinct acid reaction. Let it rest for two hours; filter through calico; wash the precipitate with a little cold Distilled water, and add to the filtrate a solution of Ammonia until the fluid has a faint ammoniacal odour. Collect the precipitate on a cloth, wash it twice with ten ounces of cold water, squeeze it gently with the hand, and dry it on the vapour bath. Pulverise the dry precipitate, put it into a flask with six ounces of the rectified Spirit, boil, let it rest for a few minutes, and pour off the spirit. Treat the undissolved portion in a similar manner with fresh Spirit, until it is exhausted. Unite the spirituous solutions, add to them four ounces of Distilled water, and distil so as to recover the greater part of the spirit. To the residue of the distillation, add by degrees, and with constant stirring, Dilute Sulphuric acid till the fluid has a slight acid reaction. Evaporate the whole to complete dryness on the water bath, pulverise the dry product, pour on it gradually one pint of cold Distilled water, stirring diligently, filter through paper, evaporate the filtrate to the consistence of syrup, spread it in thin layers on flat porcelain or glass plates, and dry it at a heat not exceeding 140°. Preserve the product in stoppered bottles.

(The Beberia is dissolved out of the bark, by the Sulph. acid in the form of a soluble Sulphate of Beberia. The excess of acid is then partly neutralised with lime, still leaving a slight excess. The Sulph. Lime is separated by filtration, and Beberia precipitated from the filtrate by the addition of Ammonia. The dry precipitate is acted on by spirit, which dissolves the Beberia. The spirit being distilled off, the residue is dissolved in $S O_3$, the sulphate solution evaporated to dryness, again dissolved in water, and evaporated so as to form scales.)

Sulphate of Beberia, thus obtained, has the composition $(C_{35} H_{20} N O_6) + HO + SO_3$. (B. P.) It does not crystallise, but is prepared in thin brown scales, translucent, yellow when in powder, very bitter in taste. It is soluble in water and alcohol. The solution gives a precipitate with Ba Cl, and with caustic soda a yellowish precipitate of Beberia, which is dissolved by agitating the mixture with twice its volume of ether. (B.) Separated by a pipette and evaporated, the ether leaves a yellow translucent residue (Beberia) soluble in dilute acids.

Action. Uses.—Tonic, Antiperiodic, Febrifuge. It resembles Sulphate of Quinine in its action and uses, as has been ascertained by Dr Christison and others. It is, however, less powerful. It is given in two or three grain pills every hour, or three or four times a-day, according to the case, so that gr. xx. or so may be given before the accession of a paroxysm, or it may be given in gr. x. doses, morning and evening. Beberia is generally used in the form of the Sulphate.

ARISTOLOCHIÆ, *Juss.* Birthworts.

They are chiefly found in hot countries, though a few species extend to northern latitudes. They secrete a bitter principle and Volatile Oil.

ASARABACCA. The leaves of *Asarum Europœum*, a native plant, are possessed of very irritant properties, and have been used as Errhine. It used to be collected near Kirkby Lonsdale in Westmoreland.

SERPENTARIÆ RADIX, B. Aristolochia Serpentaria, *Linn.* The Rhizome, dried. Virginia Snake-root. *Gynandria Hexandria*, Linn.

Several species of Aristolochia were employed by the ancients and still are so on the Continent, as well as in Asia. The officinal species was probably first brought to notice as a *Snake-root* by settlers in America. It is first mentioned in Johnson's edition of Gerard's Herbal.

Rootstock perennial, roundish, with numerous root-fibres; throwing up several herbaceous stems 8 to 10 inches high, slender, flexuose, jointed at irregular distances, often of a reddish colour at the base. Leaves alternate, shortly petioled, cordate, acuminate, smooth, and of a pale yellowish-green colour, a little downy beneath. The peduncles are produced on the stem, but near the root, nearly unifloral, with one or more bracts. The perianth is tubular, contorted like the letter S, inflated at its two extremities, its throat surrounded by an elevated ridge, and its border expanded into a broad irregular margin, forming an upper and under lip. The anthers 6, attached to the sides of the fleshy style, which is situated in the bottom of the perianth, covered by the spreading 6-lobed stigma. Capsule obovate, 6-angled, 6-celled with many flat seeds.—A native of the middle, Southern, and Western States of North America. The root is collected in Western Pennsylvania and Virginia, in Ohio, Indiana, and Kentucky.—Nees von E. 143; St. and Ch. 180.

American writers state that the roots of two other species, *A. tomentosa* and *A. hastata*, are also collected. The latter is closely allied to *A. serpentaria*, the other climbs to the tops of tall trees; but their roots are said scarcely to differ from those of *A. serpentaria*. The roots of *Spigelia marylandica* are also sometimes found intermixed. Nees von Esenbeck, moreover, mentions a species, *A. officinalis*, Med. Pfl. t. 144, which may be only a variety of *A. serpentaria*.

Virginia Snake-root is in tufts of long, slender, frequently interlaced, and brittle fibres, attached to a short, contorted, knotty head or caudex. The colour, which in the recent state is yellowish, becomes brown by time. The smell is strong, aromatic, and like Camphor and Valerian; the taste warm, very bitter, and camphorous. The root yields its virtues to water, to Alcohol, and to proof Spirit. The active ingredients are probably the Volatile Oil and a Bitter Extractive, which is also acrid, and was detected by Chevallier and Bucholz.

Action. Uses.—Stimulant, Tonic, Diaphoretic, and Emmenagogue in doses of gr. x.–gr. xxx. In large doses it causes nausea and purging. Used to be employed in cases of atonic fevers, &c., and in Exanthemata, where the eruption is tardy in appearing, or has receded.

Pharm. Prep.—Tinctura Cinchonæ Comp.

Infusum Serpentariæ, B. Infusion of Snake-root.

Prep.—Infuse *Serpentary* root bruised ℥¼ in boiling *Aq. dest.* ℥x. for two hours in a covered vessel. Strain.

Action. Uses.—Diaphoretic in doses of f℥jß, every two or three hours.

Tinctura Serpentariæ, B. Tincture of Snake-root.

Prep.—B. *Serpentary* bruised ℥ijß in *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Stimulant adjunct to Tonics and Diaphoretics in doses of from f℥j.–f℥ij.

EUPHORBIACEÆ, *Adr. de Jussieu.* Spurgeworts.

They abound in tropical countries; many species, however, are found in the southern parts of the temperate zone, but in the northern only herbaceous species, with Buxus as a shrub. The Euphorbiaceæ are remarkable for acridity, which is contained in the milky juice; hence some are used as local, and some as general stimulants; others are poisonous in nature. A few secrete Volatile Oil in the bark, as Cascarilla; and others, fatty oil united with acrid principle in their seeds, as in Castor and Croton oils. The roots of *Janipha Manihot* secrete fecula and acrid principle, which latter is dissipated by heat.

The *Stillingia sebifera*, or Tallow-tree, belongs to this order, and is cultivated very extensively in some parts of China. It is valued for the white sebaceous matter that envelopes its seeds, which, containing both Stearine and Elaine, is a true *Vegetable Tallow*.

Tribe *Ricineæ*, *Adr. de Jussieu.*

CROTON, *Linn.* *Monœcia Monadelphia.*

Flowers monœcious, or rarely diœcious. Calyx 5-parted. *Males*—Petals 5. Stamens 10 or more, distinct. *Females*—Petals none. Styles 3, divided into two or more partitions. Capsules tricoccous. *Adr. de J.*

Cascarillæ Cortex, B. Croton Eleuteria, *Bennett.* The Bark. (From the Bahamas.) Cascarilla.

Cascarilla was first made known by V. Garcias Sabat in 1692. The name, signifying a little bark, is applied by the Spaniards to a variety of barks, particularly several kinds of Cinchonas. It is intended in the Pharmacopœia to indicate a bark known for 150 years, which Dr Pereira has shown comes principally from the Bahamas, and which Dr Lindley has proved (Fl. Med. p. 179) to be the produce of *Croton Eleuteria* of Swartz and Bennett, and not of *Croton Cascarilla* of Don.* Nees von Esenbeck has also shown that *C. micans* of Swartz, a Jamaica plant, yields some of the Cascarilla of

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* It appears that this *C. Cascarilla* yields the *Copalchi bark* of Mexico, and also the bark known as *Natri* in Chili and Peru. In each of these countries it is very highly esteemed as a tonic, being considered as superior even to Cinchona bark in the treatment of some of the tropical fevers. (Dr Stark.)

the Continent. Both these plants are figured in the Pfl. Med. of Nees, Suppl. t. 22.

The *C. Cascarilla* of Linnæus (*C. linearis* of Jacquin), the *Wild Rosemary bush* of Jamaica, does not appear to yield any bark like Cascarilla, or to have the sensible properties of that bark.

(The new genus *Cascarilla* belongs to the order *Cinchonaceæ;* it yields one kind of Carthagena bark, and the bark called *Quinquina nova.*)

Croton Eleuteria forms a small tree. Branches and twigs angular, rather compressed, striated, downy, ferruginous. Leaves stalked, alternate, ovate, with a short but obtuse point, green on the upper surface, silvery and densely downy beneath. Flowers monœcious. Racemes axillary and terminal, branched. Males uppermost and smallest; females below, few, and on short stalks. Filaments 10 to 12. Ovary roundish. Styles 3, bifid. Stigmas obtuse. Capsule roundish, minutely warted, about the size of a pea, with 3 furrows, 3 cells, and 6 valves. (*Lindley.*)—Thickets of Jamaica and other West India Islands. This species, having the name of Eleutheria, from one of the Bahamas, has been proved by Dr Lindley, from information and authentic specimens from the Bahamas, to yield the true Cascarilla bark, as had been before stated by Drs Wright and Woodville.—Nees von Esenb. t. 139; St. and Ch. 150.

Cascarilla may be confounded not only with Copalchi, but also with that kind of Cinchona called Grey or Huanuco bark. It consists, however, of irregular fragments, which are thin, two to three, sometimes four inches in length; they are moderately quilled, a little twisted, or flat, about the thickness of a pencil or that of the little finger; of a greyish colour externally, much fissured, covered in many parts with a whitish lichen; the substance of the bark of a brownish colour, and its internal face smooth. It is compact; the fracture short, brittle; the powder of a light-brown colour. It has a weak though aromatic odour; the taste is bitter, a little acrid and spicy. M. Duval, in recently analysing it, found it to contain Albumen, Tannin, a bitter crystallisable substance (*Cascarilline*), Red Colouring matter, Fatty matter with a nauseous smell, Wax, Gum, Volatile Oil, with an agreeable smell, Resin, Starch, Pectic acid, Chloride of Potassium, Salts of Lime, Woody fibre. *Cascarilline* when pure is white and crystalline, without odour, has a bitter taste, which, however, is not at first perceptible from its sparing solubility; but it communicates its bitterness to a large quantity of water. It is very soluble in Spirit and Ether, and appears to be a non-azotised neutral substance of the nature of Salicine. The properties of the bark, no doubt, depend chiefly on the Volatile Oil and the Cascarilline. These are taken up by Spirit, and partially by water.

Action. Uses.—Stimulant Tonic; has been considered Febrifuge, and may be advantageously prescribed with Cinchona. It is chiefly employed in Dyspepsia and in other complaints requiring a warm Tonic.

Dose.—Of the powder gr. x.–gr. xxv.; may be given with Soda in Milk.

Infusum Cascarillæ, B. Infusion of Cascarilla.

Prep.—B. Infuse *Cascarilla* in coarse powder, ℥j. in boiling *Dist. water* ℥x. in a covered vessel for one hour. Strain.

Action. Uses.—A light warm Tonic in doses of f℥jß.

Tinctura Cascarillæ, B.

Prep.—B. Take *Cascarilla* bruised ℥ijß, *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Stimulant and Tonic adjunct to draughts in doses of fʒj.–fʒij.

Oleum Crotonis, B. Croton Tiglium, *Linn.* The Oil expressed from the seeds. Croton Oil.

The seeds, called *Jamalgota*, were given to Dr Royle when in India as the *dund* of the Arabs. They were, no doubt, employed at those times, as well as subsequently, in Europe, under various names, as *Grana Tilli*, also *Tiglia*, &c., and the wood, as *Lignum Moluccense.* Having passed out of practice, they were re-introduced by the notices of Dr White and of Mr Marshall, published in Ainslie's Materia Medica of India, and in a publication of Mr Conwell.

Croton Tiglium forms a small tree, of 15 to 20 feet in height, with the young branches smooth and roundish. Leaves oval-oblong, acuminate, 3–5 nerved, with shallow glandular serratures, thin, membranous, with 2 glands at their base, the younger leaves covered with minute stellate scattered hairs. Petioles short, somewhat angular, with a few stellate hairs when young. Stipules 2, subulate, minute. Racemes terminal, erect, simple, male at apex, female single, below. Flowers downy. *Male*—Calyx 5-cleft. Petals 5 lanceolate, and woolly. Stamens 15 (15 to 20, woolly at base, *Roxb.*), distinct. *Female*—Calyx 5-cleft, permanent. Styles long, bifid. Capsules oblong, obtusely triangular, the size of a hazel nut, closely covered with minute stellate hairs; the cells completely filled with the solitary seeds. Skin of the seeds pale dull-brown, over-lying a harder, dark, and smooth integument. *Hamilton* and *Roxburgh*, *C. Jamalgota*, Ham. Linn. Trans. xiv. 258. Indigenous everywhere in Bengal; found also in the Indian Peninsula and Ceylon.—*Lindley*, Fl. Med. p. 181.

Croton Pavana (Ham. *l. c.* p. 258), having ten stamens, and the seeds much smaller than their cells, is another species, which yields what Dr Hamilton considers to be the original Tiglium seeds. It is a native of Burmah, Assam, and Silhet, perhaps also of Amboyna.

Croton Roxburghii, Wall. (*C. polyandrum*, Roxb.), is a native of the Circar mountains; it bears seeds to which the name *Jamalgota* is also applied.

The *Croton Tiglium* has a disagreeable smell, and the taste of the leaves is exceedingly nauseous and permanent. (*Roxb.*) All parts of the plant seem provided with an acrid purgative principle, but the seeds alone are officinal, as yielding the Oil. These are each about the size of a grain of Coffee, oblong, rounded at the extremities, with two faces, the external more convex than the internal, separated by each other by longitudinal ridges, and each divided from a similar longitudinal ridge, forming altogether an irregular quadrangular figure. Sometimes, when there are only two seeds in the capsule, the internal surface is flat, with a groove formed by the central axis. The shelly covering of the seeds being sometimes partially removed, they have a mottled appearance; but if entirely so, they are blackish. The kernel is oily, of a yellowish-white colour when fresh, but becoming brownish by age. It has a large embryo, with leafy cotyledons. In India the seeds with their coverings are subjected to torrefaction, and the embryo usually separated before they are prescribed medicinally. In Europe their effects are obtained by prescribing the Oil, commonly called *Croton Oil.* This is prepared by bruising the kernels, and subjecting them to pressure, when about 50 per cent. of Oil may be obtained. But some Oil is also imported from Ceylon. According to Dr Nimmo, the seed consists of 64 parts of kernel and 26 of covering, and the kernels yield 60 per cent. of Oil. Both Albumen and embryo contain some of the acrid principle.

The analyses of Pelletier and Caventou, and of Brandes, displayed a trace of Volatile Oil, *Crotonic acid*, which is acrid and volatile; Fixed Oil, *Crotonine*, an alkaline and crystalline body (since shown to be only a fatty salt of Magnesia); Resin, Gum, Albumen and Gluten, Salts, Lignin, &c. The active properties have been supposed to depend on the *Crotonic acid*, which passes off with the fixed oil, whether this is separated by expression or by being dissolved in Ether. But Dr Pereira doubts whether this acid in its pure state possesses any active properties; and Mr Redwood has found, on experiment, that both Crotonic acid and its salts are inert.

Croton seeds are powerfully Cathartic, and in very common use in India as Purgative Pills, commonly called *Jamalgota Pills.* The natives usually separate the embryo, and combine the albumen of the seed with Catechu or Pepper. About a grain, or half a seed, is sufficient for a dose, though they often take larger doses.

OLEUM CROTONIS. Oleum Tiglii. Croton Oil.

Croton Oil, when quite pure and fresh, is nearly colourless, but as usually met with, it is rather viscid, yellowish, and even of an orange-colour, from over-roasting of the seed. It has a faint but peculiar smell, and a permanent acrid taste, which is most felt in the throat. The Oil is soluble in Ether, as well as in the volatile and fixed oils. The B. P. 1864 gave as a test of its purity:—"Agitated with its own volume of Alcohol, and gently heated, it forms a clear solution, from which about three-fourths of the oil separates on cooling." Castor Oil, which is the only oil likely to be used in adulterating it, is soluble in Alcohol. But Dr Pereira has examined both kinds of the commercial oil—the *East Indian*, which is pale in colour, and the *English*, which is of a dark brown, and more energetic than the other. When the latter, which is probably the purest, is shaken with an equal bulk of pure Alcohol, he finds that a uniform mixture or solution is obtained, which does not separate at all, unless artificial cold be applied. When the *E. Indian* oil is treated in the same manner, a milky mixture is formed, which, on a gentle heat, becomes limpid. After about 24 hours this does separate into two strata, but the separation is not complete; for the lower stratum, which is largest, consists of oil holding some Alcohol in solution, and the upper one of Alcohol containing some oil. The test of 1864 was based on incorrect data; it is therefore omitted from the B. P. of 1867. (Dr Pereira thinks it possible that the pale E. I. Croton Oil may be adulterated with *Jatropha Oil.* But Dr Royle has seen Croton Oil made in India from the blanched seeds, which, though necessarily pure, was quite pale in colour.)

Action. Uses.—Drastic Purgative in obstinate Costiveness and torpid state of the Intestinal canal, or when a Hydragogue, or the speedy action of a Cathartic, is required. Sometimes is very useful in nervous disorders, as in Tic Douloureux. Rubbed on the skin, it acts as a Rubefacient; and is frequently employed as a Counter-Irritant to relieve internal affections, either in its pure state, or dissolved in twice its bulk of Olive Oil, &c. Bourchardat recommends 20 parts being added to 8 parts of diachylon plaster as a repulsive.

Dose.—As a Purgative ♏j.–♏ij. or ♏iij. made up into pills, to which Opium is sometimes added. The liquid form is objectionable on account of the acrid sensation produced in the throat.

Linimentum Crotonis, B. Liniment of Croton Oil.

Prep.—Mix *Croton Oil* ℥j. with *Oil of Cajuput* and *Rectified Spirit* of each ℥iijß.

Used as a counter-irritant in sub-acute inflammations of the chest and abdomen. Rubbed on the skin, it brings on, after a few hours, an eruption of pustules. (Made with Olive Oil in B. P. 1864.)

Oleum Ricini, B. Ricinus communis, *Linn.* Oil expressed from the Seeds. (Imported chiefly from Calcutta.) Castor Oil Plant. *Monœcia Monadelphia*, Linn.

This plant appears to be the Gourd, or the plant so translated, in Jonah iv. 6, 7, 9, 10. (See *Kikayon*, in Bibl. Cycl. ii. p. 203.) It is also the κικι or κρότων of Dioscorides, and its Oil has been employed in medicine from the earliest times by Hindoos, Egyptians, Greeks, and Arabs. The Greek names are taken from the insect called the tick (in Latin *ricinus*) which the seeds resemble.

Different opinions are held respecting the number of species belonging to this genus; but several varieties have no doubt been raised to the rank of species. These are found in Java, and throughout India. One has been named *R. europæa*, but it must have been introduced from the East, and is annual because unable to withstand the cold of winter. The common species may be seen in India, especially at the borders of fields, with stems of considerable thickness, and attaining a height of sixteen to twenty feet, and surviving for many years. The oil is valued as a medicine, and for burning, and the leaves are used for feeding the Arendy silk-worm.

Root perennial or annual, long, thick, and fibrous. Stems (fig. 94) round, thick, jointed, channelled, hollow, glaucous, of a purplish-red colour upwards.

Leaves large, palmato-peltate, deeply divided into lanceolate, serrated segments, on long, tapering, purplish petioles, with glands at the apex of the petiole. Flowers monœcious, in terminal panicles, the lower male, the upper female, all articulated with their peduncles, and sometimes supported by biglandular bracts. Calyx 3-5 cleft, valvate. Petals wanting. *Male*—Stamens numerous, with the filaments branched (*a*) and united below, with distinct globose cells of the anthers (*b*). *Female*—Style 1. Stigmas 3, bipartite (*c*), plumose, coloured red. Capsule tricoccous, covered with spines, 3-celled (*d*); cells 1-seeded. Seeds pendulous, elongated, ovate, convex externally, somewhat flattened on the inside, of a pale grey colour, but marbled with darker colours (*e*). The seed is covered by a thin, coriaceous, smooth seed-coat, com-

Fig. 94.

posed of two layers; at its upper end is observed the fleshy swelling which has been termed *Strophiole*, with a delicate white membrane investing the nucleus, which is large, oleaginous, and consists of albumen containing in the middle a large leafy embryo (*f*). Native of India; cultivated in many countries.

Two varieties of Castor Oil seed are known—one large, the other small. The latter is thought to yield more oil, and of a superior quality. Geiger found in 100 parts of these seeds, exclusive of moisture, 23·82 parts of seed covering, and 69·09 of kernel. These 69·09 parts contained 46·19 parts of fixed Oil, 2·40 of Gum, 20·00 of Starch and Lignin, and 0·50 of Albumen. The kernel, when fresh, is of a white colour, and sweetish almond-like taste, which is followed by some acrimony. The Oil may be extracted from the seeds by decoction in water, or by expression, with or without the aid of heat; and for experiment, by the agency of Alcohol. Sometimes the Oil is boiled with water to dissolve out the Mucilage and to coagulate the Albumen. Dr Christison sums up the result of various papers (by Wright, Boudron, Henry, Bussy, and Guibourt) by stating—that by simple expression a mild oil of excellent quality may be extracted alike from the small and large varieties of the seed: that when so prepared, it is apt to become sometimes rancid, but may be prevented from doing so if heated to about 200°, so that its Albumen is coagulated and detached: that the embryo is scarcely more active than the Albumen of the nucleus, and that the husk and perispermal membrane are inert: that if the seeds be boiled in the Eastern way, without first roasting them, or driving off the residual water from the Oil by heat, an Oil of fine quality is obtained, which keeps well, but is probably not quite so active: that the active part of the Oil is apparently volatilisable during decoction with water, so that long ebullition may materially impair its energy: and that if the seeds be roasted before being expressed, or the Oil be exposed to a considerable heat, as in the American process, peculiar products are apt to be engendered, which greatly increase the acridity.

Castor Oil is imported in the largest quantities from the East Indies, and this is commonly called *cold-drawn* Castor Oil. Some is expressed from the seeds in England. Some is also imported from North America and the West Indies. It has a pale straw-colour, a faint but unpleasant smell, a mild oily taste, sometimes accompanied with a little acrimony. Though heavier than most fixed oils, it is lighter than water, and viscid. Sp. Gr. 0·969 at 55° F. If exposed to a cold of 32° it deposits a few grains of solid fat. Exposed to the air, it becomes rancid, and dries up. It is soluble in all proportions in both Alcohol and Ether. By the action of Hyponitrous acid upon it, a solid fatty matter is produced, which has been called *Palmine*. It is saponified by alkalies, and is stated by Bussy and Lecanu to contain three fatty acids, each in combination with Glycerine. The acids are *Ricinic*, *Margaritic*, and *Elaiodic*. There is also an *acrid resin*. The solubility of the Oil in its own volume of Alcohol, and in 2 vols. of rect. Spirit, is adopted as a test of purity by the B. P. But Dr Pereira has shown that Castor Oil (as well as pure Croton

Oil) will enable other fixed oils, when mixed with it, to dissolve in rectified Spirit. So that this test is useless to detect adulteration with another fixed oil, even when to the extent of 30 or 50 per cent. He has further shown that the oil and spirit exert mutually a solvent action on each other. The solution obtained by mixing equal quantities of Castor Oil and rect. Spirit, separates after some weeks into two layers, the upper one of spirit holding oil in solution, the lower of oil holding a large quantity of spirit in solution. (*See* Croton Oil.)

Action. Uses.—Purgative. Castor Oil seeds, though mild tasted, even in their fresh state, are acrid.* The Oil is a mild but certain laxative, acting quickly, and is particularly eligible whenever it is wished to produce as little irritation as possible along the intestinal canal. With Oil of Turpentine fʒij. a particularly efficient purgative may be formed. (*c.*)

Pharm. Prep.—Castor Oil is used in preparing Collodium flexile, also in Linimentum Sinapis Co., and Pil. Hyd. Subchlor. Co.

Dose.—Of the Oil f℥ß–f℥jß swimming on weak Spirit and water, or on hot Milk, Coffee, shaken up with Vinegar, &c. For children fʒj. or fʒij. made into an emulsion.

Tapioca. Janipha Manihot, *Humb. and Bonpl.* Fecula of the Root. *Jatropha Manihot*, Linn. *Manihot utilissima*, Pohl.

Tapioca, first mentioned by Piso in his Nat. Hist. of Brazil, p. 52, is a starch-like substance yielded by the above plant, which has lately been made a member of a new genus, and named *Manihot utilissima* by Pohl.

A shrub, 4-6 feet high. Root large, tuberous, fleshy, and white, with a milky, acrid, poisonous juice. Leaves palmate, 5-7 parted, smooth, glaucous beneath; segments lanceolate, quite entire. Flowers axillary, racemose, monœcious. Calyx campanulate, 5-parted. Petals none. Stamens 10. Filaments unequal, distinct, arranged around a disk. Style 1. Stigmas 3, consolidated into a rugose mass.—Adr. de Juss. and Hooker.—Cultivated in the West Indies, and in many parts of South America.—B. M. 3071.

Of this plant there are two distinct varieties—one known as the Bitter, the other as the Sweet Cassava. The former is about six feet high, the leaves of a darker green, and the stem of a dark-brown colour; the roots are longer in coming to maturity, much larger, about twenty inches in length, and ten in circumference. The juice is acrid and poisonous, owing, it is said, to the presence of Hydrocyanic acid (*Henry* and *c*), and probably also to an acrid principle. It is cultivated for making the Tapioca of commerce and Cassava Bread. The latter is made by grating the fresh roots, squeezing out the juice,

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* Dr Royle was once called in a great hurry to the hospital-boat when proceeding with a battalion of Artillery up the Ganges, with the statement that several men had been poisoned or seized with cholera. The seeds immediately revealed what the "Indian filberts" were which the men had been picking and eating. The majority recovered rapidly; but three of them suffered severely, and were not discharged from hospital for some time.

and then baking into cakes on an iron plate. The Tapioca is prepared by beating the root into a pulp, washing it with cold water, and then allowing the fæcula to subside from the milky fluid which flows from it. Being then dried on heated plates, it becomes of a granular form. By the washing and heating, the poisonous matter, being both soluble and volatile, is dissipated.

The Sweet Cassava (sometimes considered a distinct species, named *Manihot Janipha*, and a third plant distinguished as *M. Aipi* by Pohl) is about four feet high, the root about a foot in length, and seven or eight inches in circumference, of a light-brown colour. It is very juicy, something resembling chestnuts in taste, and is used as a vegetable either boiled or roasted. But much of it is employed in making a fermented liquor from the root scraped into a pulp, and from which the liquor is squeezed. This is called *Piwarry*, and drunk by the Indians as an intoxicating liquor. (Mr Gill.)

The irregular grains of which Tapioca consists are about the size of large shot, whitish, and, like other kinds of Starch, without odour or taste. The starch grains are very minute, but regular and characteristic in form. (See drawing—AMYLUM.) Tapioca has the general characteristics of Starch, of which it is a pure form.

Action. Uses.—Dietetical, Demulcent. Much approved of as a diet for the sick-room and for infants at the time of weaning.

Tribe *Euphorbieæ.*

EUPHORBIUM. Concrete resinous juice of undetermined species of Euphorbia, *Linn.* (*E. canariensis.*) *Monœcia Monadelphia*, Linn.

Euphorbia. Flowers incomplete, collected into monœcious heads composed of one female and numerous male flowers. Involucre campanulate, with 5 divisions and 5 alternate glands. *Male*—Naked, consisting of a single stamen upon a pedicel, intermixed with scales, surrounding the female. *Female*—A single pistil. Styles 3. Stigmas bifid. Capsule 3-celled, bursting at the back. Seeds solitary, pendulous.—This genius is multiform in habit, some being cactus-like, among which must be the officinal species, having joint angular stems, with branches of a similar structure, and double prickles at their angles. When wounded they exude an acrid milky juice, which concretes upon the surface, usually round these prickles, and constitutes the Euphorbium of commerce.

Euphorbium was employed by the early Greek physicians, and is noticed by the Arabs by the name *Furfioon.* The species yielding it is still uncertain. The Euphorbium of the ancients was obtained from Mauritania, that of modern commerce apparently entirely from Mogadore. *E. canariensis*, a plant of the Canary islands, *E. officinarum*, which is said to be found in Arabia, and the hotter parts of Africa, and *E. antiquorum*, common in Arabia and all over India, have been adduced by various authorities. The last Dr Royle found comparatively inert. Dr Pereira, after examining the branches found mixed with the Euphorbium of commerce, came to the conclusion that they belong to *E. canariensis*, a native of northern Africa as well as of the Canaries. He observes that some of the spines found resemble those of the analogous species, *E. tetragona.*

Euphorbium is in irregularly-shaped tears, usually pierced with one or with two diverging holes, made by the double prickles of the plant on which it had dried. These sometimes remain in the holes. The colour is of a dull yellowish-white, something like that of inferior Tragacanth. It is friable, with little odour, but the dust causes violent sneezing and irritation to the eyes, requiring the face to be well protected; it is very irritant to whatever part it is brought in contact with, and the taste is, after a short period, acrid and burning. It is composed of an Acrid Resin about 60 per cent., of Wax 14, Malate of Lime 12, Malate of Potash 1, Bassorine, probably a little Caoutchouc, Lignin, and water. It is, therefore, a Cereo-Resin, and not a Gum-Resin. It burns with a pale flame and rather an agreeable odour. Water takes up but little of it; Alcohol and Ether are its best solvents. Its active principle is the Resin.

Action. Uses.—Powerful Irritant; will produce incessant sneezing, and even bloody discharges; causes ophthalmia if blown into the eyes. An acrid Emetic, Cathartic, and Rubefacient; very dangerous, and seldom used.

Antidotes.—Oil, emollient drinks, oleaginous enemata. Obviate inflammation by blood-letting, baths.

KAMALA, B. Rottlera tinctoria, *Roxb.* The powder which adheres to the capsules. Kamala. (Imported from India.)

The powder obtained from the fruit of this tree has long been known in India as producing a red dye called "Wurrus." The tree was named by Roxburgh after Dr Rottler, an eminent Danish missionary, in 1798. It is only in late years that the powder from the capsules has been used by Indian physicians as a remedy for tapeworm, and thence introduced into this country.

Rottlera tinctoria is described by Roxburgh in his "Plants of the coast of Coromandel." A tree of 12–20 feet high of the Nat. order Euphorbiaceæ. Common in hilly districts of India, ascending to a height of 5000 feet. Found also in the Philippines, China, and north-eastern Australia, as well as in the Somali country in Africa. The fruit is tricoccous, of the size of a pea, covered on the outside with minute, sessile, roundish, semi-transparent glandular bodies, of a bright-red colour. The fruit ripens in the spring, when it is gathered, and the red powder brushed off and preserved for use.

Kamala, as found in the bazaars of India, is of a brick-red colour, and possesses that peculiar mobile character which is observed in Lycopodium and Lupuline. (Hanbury.) It mixes with water with difficulty. The greater part dissolves in Alcohol. Ether dissolves resin, and a peculiar crystalline principle called *Rottlerin*, leaving some stellate hairs. By the microscope, Kamala is seen to consist of roundish granulæ of $\frac{1}{250}-\frac{1}{500}$ inch in diameter, and these stellate hairs. Kamala has but little smell or taste. It is insoluble in cold, and nearly so in boiling water, but dissolved by alkaline solutions, forming a deep-red liquid. The powder of Kamala ignites with a flash if blown into the flame of a candle.

Action. Uses.—Kamala, suspended in water, has obtained great repute in India as a remedy for tapeworm. A single dose of gr. xxx.

to gr. clxxx., is said to be sufficient. It acts as a brisk purge, and brings away the worm, with its head. We have not had much experience of this remedy in England.

PIPERACEÆ, *Richard*. Pepper-worts.

The Piperaceæ are allied in some respects to Polygoneæ, in others to Urticeæ. They are sometimes placed among Endogens, at other times among Exogens. They inhabit the tropical parts of Asia and America, with a few species extending to higher latitudes, and are characterised by pungent and aromatic properties. Besides the officinal species, the Piper Betle is much cultivated and famed for its moderately pungent and aromatic properties, its leaf being employed to envelope the fragments of Areca Catechu, of Pale Catechu, and of Lime, which form the famed masticatory of the East, known as Pan or Betle.

PIPER, *Linn*. *Diandria Trigynia*, Linn.

Spike covered with flowers on all sides. Flowers hermaphrodite, each supported by a scale. Stamens indeterminate in number, often two. Anthers 2-celled. Ovary 1-celled. Ovule solitary, erect. Stigma trifid or multifid. Berry 1-seeded.—Shrubs, rarely trees, aromatic, with knotted, jointed branches. Leaves alternate, very entire, often nerved. Spike supported by a spathe at the base, opposite to the leaves, rarely terminal, cylindrical, sometimes subglobular. H. B. and K. This genus has been subdivided by Miquel.

PIPER NIGRUM, B. Piper nigrum, *Linn.* Dried unripe berries. Black Pepper. (Imported from the East Indies.) These decorticated, form *Piper album*, or White Pepper.

The πεπέρι of Hippocrates and Dioscorides is no doubt our Pepper, the name being derived from the Persian *Pilpil.* (See *P. longum.*) The Hindoos were probably the first to investigate the properties of Pepper. It grows in abundance on the Malabar coast, &c., whence it is now imported, as well as from the Malay Peninsula, Sumatra, and other islands.

The Pepper-vine is a perennial, with trailing or climbing, round, flexuose stem, from 8 to 12 feet in length, dichotomously branched, articulated, swelling near the joints, and often radiating. The leaves are distichous, broadly ovate, acuminate, occasionally somewhat oblique, 5 to 7-nerved, the nerves prominent beneath, connected by lesser transverse ones, of a dark-green colour and glossy above, pale glaucous green beneath. Petioles rounded, nearly an inch in length. Spikes opposite the leaves, stalked, from 3 to 6 inches long, slender, drooping; apparently some male, others female, while sometimes the flowers are furnished with both stamens and pistil. (*Lindl.*) Stamens 3. Fruits distinct, round, sessile, about the size of a pea, at first green, then red, afterwards black, covered by pulp. Native of India, and the Indian Islands.—Nees von E. 21; St. and Ch. 174. Cultivated in the West Indies.

Dr Roxburgh's *Piper trioicum* yields the Pepper of the Rajahmundry Circars, and which he described before he had seen the true *P. nigrum.* But after he had done so, he observed that the leaves of *P. trioicum* have a glaucous appearance, which readily distinguishes it from *P. nigrum*, which has shining dark leaves. Dr Heyne, who succeeded him in the superintendence of the Pepper cultivation, says that the want of success in culture at Rajahmundry was owing to defects in cultivation, whereby they had *starved* these plants into celibacy. (*See* Royle, Product. Resources of India, pp. 53 and 67.)

Black Pepper is formed by the above berries, gathered before they are quite ripe, and dried in the sun. They then become black and wrinkled from the drying up of the pulpy part, which covers a round greyish-white coloured seed.

White Pepper is the same berry allowed to ripen, when its pulpy part is easily removed by soaking in water and subsequent rubbing. The dried pulpy covering of the Black Pepper has in this country been removed by mechanical means, to form a white Pepper.

Pepper in both these states has, when bruised, an aromatic smell and a hot, spicy, pungent taste, which is milder in the white Pepper. These properties are taken up partially by water, completely so by Ether, Alcohol, or proof Spirit. Analysed by Oërsted and by Pelletier, it was found to contain a peculiar neutral principle, which has been called *Piperine*, an Acrid Resin, a little Volatile Oil, Gum, Starch, Bassorine, Extractive, Malic and Tartaric acids, Salts, and Lignine. Powdered Pepper of the shops is adulterated with Flour, Sago, and other substances. They may be detected by the microscope.

Piperine, when perfectly pure, is in colourless rhombic crystals, neutral and not alkaline, insoluble in water, soluble in Alcohol and Acetic acid, less so in Ether; fusible at 212°, and volatile. Pelletier says, that, when quite pure, it is tasteless, and ascribes any active properties to a portion of the acrid resin. Dr Christison, however, states that the very whitest crystals he has been able to obtain were as acrid as those which were brownest, and also that it exists in as large quantity in white as in black Pepper, and is there more easily separated because combined with less resin. It is composed of $C_{34}\,H_{19}\,N\,O_6$. It has been recommended as a febrifuge and antiperiodic. It is turned red by Sulphuric acid.

The *Acrid Resin* is soft, becomes solid at 32° F., is soluble in Alcohol and Ether, and unites readily with all fatty bodies. Its taste is extremely pungent and acrid, and is very abundant in black Pepper. Some conceive that the properties of Pepper depend chiefly on this Resin.

Action. Uses.—Hot stimulant; pungent, grateful Condiment, and as such universally employed; thought to be Febrifuge. Chiefly used to correct the effects of other medicines in causing nausea, &c., in doses of gr. v. Contained in Pulv. Opii Comp. and Confectio Opii.

CONFECTIO PIPERIS, B. Confection of Pepper.

Prep.—B. Rub well together in a mortar *Black Pepper* in fine powder ℥ij., *Caraway* in fine powder ℥iij., *Clarified Honey* ℥xv.

(The confection of the L. P. contained Elecampane and Fennel Seeds.)

Action. Uses.—Moderate stimulant; has been introduced as a substitute for *Ward's Paste*, which obtained celebrity as a cure for Hæmorrhoids. Sir B. Brodie conceives that it acts on them as a gentle stimulus, in consequence of some of it passing along the colon.

Dose.—ʒj.–ʒij. twice or thrice a-day.

[PIPER LONGUM, L. Piper longum, *Linn.* (*Chavica Roxburghii*, Miquel.) Fructus immaturus, L. Long Pepper.

Long Pepper has been employed by the Hindoos in medicine from the earliest times. Its Sanscrit name *pippula* seems to have been the original of the Greek πεπέρι, and the πεπερέως ῥίζα would appear to be its roots, which, called *pippula mool*, are still extensively employed throughout the East. (*See* Hindoo Med. p. 86.)

Root woody. Stems shrubby, climbing, jointed. Lower leaves ovate-cordate, 3 to 5-nerved; upper ones on short petioles, oblong, acuminate, oblique, and somewhat cordate at the base, obsoletely 4 to 5-nerved and veined, coriaceous, smooth. Peduncles erect, longer than the petioles. Spikes almost cylindrical. A native of the woody hills of the Circars, as well as along the foot of the Himalayas; cultivated in Bengal.—Nees von E. 26; St. and Ch. 174. This plant has been separated by Miquel from the genus *Piper*.

This plant is cultivated also on account of its roots, which, as well as the thickest parts of the stems, are cut into small pieces and dried, and form an article of commerce all over the East. The spike of berries forms a long, nearly cylindrical body, varying from an inch to an inch and a half in length. The berries are most pungent in their immature state, and are at that time dried, when the whole becomes of a greyish colour. Long Pepper has a faint aromatic odour when bruised, but a powerfully pungent taste. Analysed by Dulong, its composition was found to be analogous to that of Black Pepper, as it contains Piperine, a concrete Oil, upon which its acrimony depends, and a Volatile Oil, to which it probably owes its odour.

Action. Uses.—Stimulant, and a substitute for Black Pepper. It was retained in the L. P. as a constituent of several old-established preparations, but it is not now officinal.]

CUBEBA, B. Cubeba officinalis, *Miquel.* The unripe Fruit, dried. (Cultivated in Java.) The Cubeb Pepper. *Diandria Trigynia*, Linn.

Cubebs were probably first made known through the Hindoos to the Arabs, being the *kubabeh* of the latter, and the *kubob-chini* of the former. It is not probable that they were known to the Greeks. (*See* Hindoo Med. p. 85.) Dr Pereira has adduced evidence that they were employed in England 500 years ago.

Stem climbing; branches round, the thickness of a goose-quill, smooth rooting at the joints; when young, petioles minutely downy. Leaves 4 to 6½ inches long, 1½ to 2 inches broad, stalked, oblong, or ovate-oblong, acuminate, rounded or obliquely cordate at base, strongly veined, netted, coriaceous, very smooth. Spikes at the end of the branches, opposite the leaves, diœcious, on peduncles the length of the petioles. Fruit rather larger than Black Pepper, globose, on pedicles about half an inch long. (*Lindley.*) A native of Java and Prince of Wales' Island.—Nees von E. 22; St. and Ch. 175.

Dr Lindley has ascertained that this is the *P. Cubeba* of the Linnean Herbarium. Blume says that the fruits of this, although of good quality, are not sent to Europe, but those that are furnished by *P. caninum*, Rumph. v. t. 28, p. 2; of this the fruit is smaller and shorter-stalked, having a distinct Anise flavour, and less pungent than the fruit of *P. Cubeba*. Dr L., however, observes, "I cannot perceive any difference in the flavour of the dried fruit of this species and of the Cubebs sold in the London shops."—Fl. Med. p. 314.

Cubeb berries, when dried, resemble Black Pepper, but are of a brownish colour, with raised veins forming a network over their surface, and are, moreover, distinguished by having a short stalk; hence

Cubebs were called *Piper caudatum* by old writers. The sarcocarp is thin, the shell hard, seed spherical, white, oleaginous. The odour of Cubebs when bruised is aromatic and rather agreeable; the taste warm, peppery, and camphoraceous. Analysed by Vauquelin, and subsequently by M. Monheim, Volatile Oil (see *Oleum Cubebæ*) was recognised, also *Cubebine*, which is a neutral substance very similar to Piperine; a soft and acrid Resin, and Extractive. The Volatile Oil, upon which the active properties chiefly depend, will evaporate on exposure, and therefore Cubebs should be powdered only as required. The powder is of a dark colour, and somewhat oily in appearance. It is said to be sometimes adulterated with Allspice powder.

Common Cubebs are the produce of the East Indies, but another kind which closely resembles and has been confounded with them was long ago obtained by the Portuguese from their early settlements in Guinea. Guinea Cubebs are the fruit of *Cubeba Clusii*, Miquel, a plant which differs from the other species in having leaves which are three-nerved, acuminate, and scarcely cordate. Its berries are stalked; their surface is corrugated, but not distinctly networked; their flavour is hot, and described by Dr Daniell as much resembling that of Black Pepper. (P. J. xiv. 198.) Dr Stenhouse finds that they contain *Piperine.*

Action. Uses.—Stimulant; used as a Stomachic in the East. Having also the power of arresting excessive discharges from the Urethra, it is much employed in Gonorrhœa, for which it is in many cases an effectual cure. It is, perhaps, best prescribed immediately after the first inflammatory symptoms have subsided; but its use requires caution, as it is apt to create irritation in the Urinary passages, and to cause swelled Testicle.

Dose.—Of the powder, gr. xx.–gr. cxx., 3 or 4 times a-day.

OLEUM CUBEBÆ, B. Oil of Cubebs.

Obtained (in England) from pounded Cubebs by distillation with water, in the proportion of about 10 per cent.

Oil of Cubebs is colourless, or pale greenish-yellow, lighter than water, thick, with the odour of Cubebs, and their pungent spicy taste. If rectified with water, it leaves a soft and resinous mass. It cannot be distilled by itself without undergoing decomposition. It is composed of C_{15} H_{12}. By standing for some time it deposits a Stearoptene, which has been called Camphor of Cubebs by Mr Winkle.

Action. Uses.—Appears to possess all the virtues of Cubebs in doses of ♏x.–fʒß. It may be given with Sugar in Water.

TINCTURA CUBEBÆ, B. Tincture of Cubebs.

Prep.—Prepare as Tinct. Aconiti, *powdered Cubebs* ℥ijß in *Rectified Spirit* Oj.

Action. Uses.—Stimulant. Used in Gonorrhœa, in doses of fʒj.–ʒij. 2 or 3 times a-day.

MATICÆ FOLIA, B. Artanthe elongata, *Miquel.* The dried leaves. (From Peru.) Matico.

Matico is a name applied in South America and Mexico apparently to the leaves of several very different plants. Martius, in the *Phar.*

Central Blatt., considered it to belong to the genus Phlomis. Mr Hartweg informs Dr Lindley that "Matico is the vernacular name applied by the inhabitants of Quito to *Eupatorium glutinosum*, or the Chussalonga." He adds, "That it is the true Matico of the inhabitants of Quito and Riobamba, I have not the smallest doubt. I have also a small quantity of powdered leaves of some shrub possessing the same virtue as the Matico, collected in Bolivia, where it is known under the name of Moxo-Moxo. From bits of square stems which I find in the parcel, I suspect this to belong to some Labiatæ." (Lindley, Veg. Kingd. p. 707.) But it is equally certain that what has been of late years imported here, and of which specimens were distributed by Dr Jeffreys of Liverpool, are the leaves, with portions of the stem and flowering-spikes, of a species of a genus allied to Piper, first called *Piper angustifolia*, but now named *Artanthe elongata.* (*See* P. J. iii. 472 and 525, and Lindl. *l. c.* p. 517.)

The leaves of Matico are described in the B. P. as "from 2–8 inches long, veined and tesselated on the upper surface, downy beneath, with an aromatic, slightly astringent, warm taste, and an agreeable aromatic odour."

Action. Uses.—Matico was first brought into notice by Dr Jeffreys as a Styptic (*Lancet*, Jan. 7, 1839) in leech-bites and wounds of arteries, and has been found efficacious in some obstinate cases of bleeding, as from the nostrils, and even from the tongue. Its *under* surface, which is reticulated with veins, and covered with hairs, should be applied, as it is probably on this structure that its utility chiefly depends. Applied to wounds, it acts as a soft plug, and its action in such cases is probably mechanical. Analysed by Dr Hodges, it was found to contain a peculiar bitter principle, *Maticina*, with Volatile Oil. But though its infusion strikes a green colour with a solution of Sesquichlor. Iron (as Peppermint will do), it contains no appreciable quantity of either Tannic or Gallic acid. It is not in any strict sense an internal Styptic, as which, nevertheless, it has been recommended by some. It has no real astringency. Its Volatile Oil may enable it to act on the genito-urinary mucous membrane in the same manner as Cubebs, or may even check hæmorrhages as the Oil of Turpentine.

INFUSUM MATICÆ, B. Infusion of Matico.

Prep.—Infuse *Matico leaves* cut small ℥ß in *boiling water* Oß for half an hour in a covered vessel. Strain.

Dose.—℥j.–℥jß.

URTICEÆ, *Juss.* Nettleworts.

The Urticeæ contain a great many plants very unlike each other, except in the structure of their inconspicuous flowers and small fruit. They are, however, divided into several tribes, which are now as often considered distinct families. They are widely diffused in tropical and temperate climates; the shrubby and arboreous species in the former, the herbaceous ones in the latter. Many secrete an acrid principle. Of the true Urticeæ none are officinal.

Tribe *Cannabineæ*. Annual or perennial, with watery juice. Flowers diœcious; male paniculate. Perianth calyx-like, 5-parted, imbricate in æstivation. Stamens 5, inserted into the bottom of the perianth. Female flowers in a spike or catkin with bracts. Perianth urceolate or spathe-like. Ovary free, 1-celled, 2-styled, with a single pendulous ovule. Not bivalved, 1-seeded. Seed pendulous. Embryo without albumen, hooked or spiral, with the radicle superior. The genera Humulus and Cannabis are officinal; each contains only a single species.

LUPULUS, B. Humulus Lupulus, *Linn.* The Common Hop. Dried Strobiles of the female plant. (Cultivated in England). *Diœcia Pentandria*, Linn.

The Hop plant was known to the Romans, being considered to be the *Lupus salictarius* of Pliny. It is found wild in many parts of Europe, and was seen by Bieberstein among the bushes and hedges of the Caucasus. It is found in China, said to be wild in North America, and to be a native of this country. Humalineæ, or Hop-grounds, are mentioned in the ninth century in Germany. In the thirteenth century Hops were introduced into the breweries of the Netherlands. Its culture is supposed to have been introduced into this country from Flanders in the reign of Henry VIII. Hops as well as Newcastle Coals were petitioned against by the city of London, the former "in regard that they would spoil the taste of drink and endanger the people;" whence Henry VIII. issued an injunction "not to put any hops or brimstone into the ale." As in the history of many other prejudices, we observe at length a complete reversal of opinion, Hops being now considered indispensable in the brewing of all malt liquors.

The Hop (fig. 95) is a perennial rooted plant, with annular pliable stems, which on poles or in hedges climb to a great extent, twining from right to left, slender, somewhat angular, rough, with little asperities and minute reflexed hairs. The leaves are opposite, the upper alternate, on long, often winding petioles, the smaller heart-shaped, the larger 3 to 5-lobed, serrated, veiny, and extremely rough, with prickle-like pubescence. Stipules 2, bifid, between the petioles, reflexed. Flowering branches axillary. Flowers numerous, of a yellowish-green colour. *Males (a)* on a separate plant (a few on the female), in axillary panicles. Perianth 5-parted; segments oblong, spreading. Stamens 5; filaments short; anthers with a projecting apex, oblong, 2-celled, opening by longitudinal lateral slits. Pollen globose. *Females* (*b*) like the males, on a separate plant, in dense catkins or strobiles, with membranous concave bracts (*d*), each supporting a flower. In place of perianth there is a membranous scale or sepal, which embraces the ovary and grows with it (*c*). Ovary ovate, subcompressed, 1-celled, with a single ovule. Stigmas 2, elongated. Fruit a strobile or catkin, formed by the enlarged bracts and scales or sepals, which are glandular and embrace the nuts. These are small, subglobular, erect, 1-seeded. Pericarp hard, but fragile, covered with yellow, cellular, superficial aromatic glands (*lupuline*) (*f*). Seed pendulous. Testa membranous. Embryo (*e*) without albumen, spiral, with long cotyledons. Radicle roundish, turned towards the hilum.—Nees von E. 101; St. and Ch. 41. Fig. 95, where a bit of the male plant is shown on the right, and the female on the left and above the male.

Hop plants grown from root-sets come to perfection in the third year from planting. They spring out of the ground about the end of April, and come into flower about the end of August. The catkins are fit to gather from the beginning of September to the middle of October, the time varying according to the sort cultivated, but chiefly by reason of differences in the seasons. They are then picked, dried by artificial heat in kilns, and packed in large long bags, or the finer in pockets. Hops consist of the leaf-like bract and of the scale-like sepal which invests the seed-nut. This, or rather the scale and the base of the bract, is covered with numerous superficial glands, which have been called *Lupulinic glands*, and simply *Lupuline*, though this name is objectionable, as also indicating the peculiar or bitter principle. Dr Ives, of New York, by

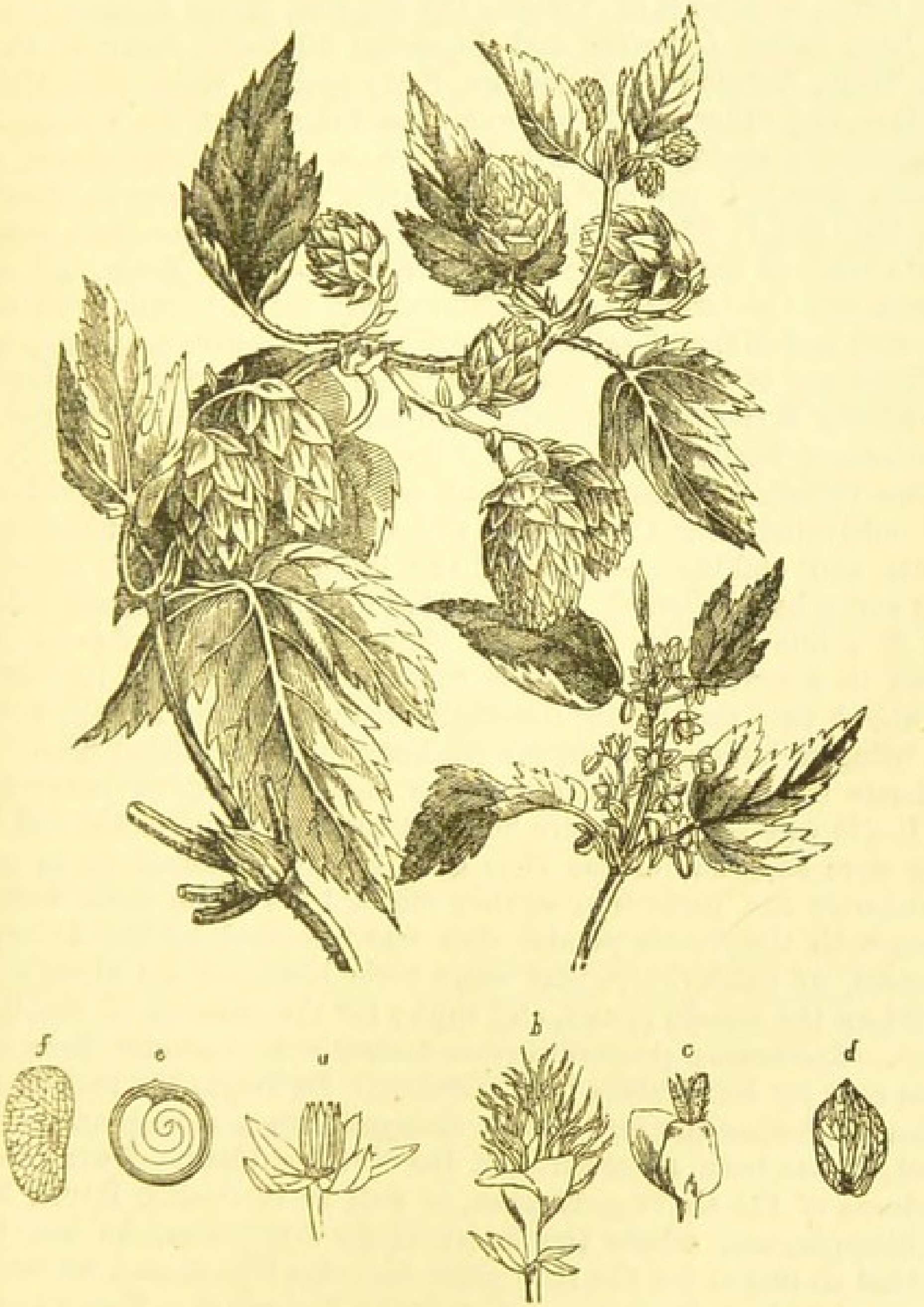

Fig. 95.

thrashing, rubbing, and sifting, procured from 6lb of Hops about 6oz. of these *grains;* but there are always intermixed some fragments of the bracts and scales. The *glands* are yellow, shining, roundish, or kidney-shaped (or shaped like an Acorn,—Personne), cellular, somewhat transparent, and sessile; the point of attachment is called the hilum (*see* a magnified view in fig. *f.* from Raspail). The catkins are officinal with the Lupuline which adheres to them. Hops are remarkable for their bitter taste combined with a very agreeable odour, especially when being picked or collected in kilns or breweries. The bitterness resides partly in the bracts, but also in the glands, to which the aromatic qualities are especially due. Analysed by MM. Payen, Chevalier, and Pelletier, these *Hop* glands were found to consist of Volatile Oil 2 parts, Bitter Extract (which has been called *Lupuline* and *Lupulite*) 10 parts, Resin 50 to 55, with Gum, Extractive, Ozmazome, Fatty matter, Malic acid, Malate of Lime, and other salts. Personne has found that the Volatile Oil is chemically analogous to Oil of Valerian, and that the glands also contain about 1 per cent. of Valerianic acid. (*Comptes Rendus*, Feb. 15, 1854.) The bracts, analysed by the above chemists, yielded only a trace of the Volatile Oil, Bitter Extract, and Resin, but some Tannin and Colouring matter, Chlorophyll, Gum, Lignin, with some free acid and different salts. A portion of the active properties both of Hops and of the Hop glands is taken up by water, but they are completely extracted by Spirit. An infusion of Hops displays the reactions of Tannic acid.

Two varieties of the Hop plant are particularly distinguished—one cultivated near Canterbury and in East Kent, of which both plants and catkins are smaller; the latter being ovoid, about an inch and a half in length, of a pale but lively yellowish-green colour, and of a fine aromatic fragrance. The West Kent or Sussex Hop grows to a much larger size, is considered hardier, and its catkins are about two and a half, sometimes four inches in length, but do not bring so high a price in the market as the East Kent hops. As root-sets from the female plants are alone planted by cultivators, Dr Royle was led to inquire how the seeds were perfected—and, if they were so, whether the Hop glands were produced in as great abundance and perfection as they might be if some *male* were set along with the *female* plants. He was informed by Mr Alderman Masters, of Canterbury, that some male blossoms are always produced on the female plants, and suffice for the purpose of fertilising them. Specimens possessing this monœcious character have been since sent by Mr Masters to Dr Lindley. Dr Royle has been unable to learn whether the female ever changes into a male plant, or *vice versâ*, as has been observed with the Nutmeg plant. Owing to the kindness of the above gentleman, as well as of Joseph Royle, Esq., of Stuppington, where the finest Hops are grown, he has been enabled to introduce the Hop plant into the Himalayas, where it is now flourishing alongside of the China Tea plant. The root-sets, with the ends dipped in wax, wrapped in cotton, and enveloped in caoutchouc-cloth, were sent by the overland mail to the East India Company's Botanic Gardens at Saharunpore. They arrived there in a living state, as reported by Dr Jameson, and have produced fine plants; as have also the seeds sent with them. The successful cultivation of Hops would bring malt liquors more within the reach of European soldiers, and assist in detaching them from the pernicious spirituous compounds of the bazaars, which now destroy the health and shorten the lives of thousands. Well-*hopped* ale, moreover, is known to be one of the best stomachics and Tonics for convalescents from many Indian diseases.

Action. Uses.—Stomachic and Tonic, slightly Narcotic. The property of Hops of giving the bitter to Beer, and, by preventing acetous fermentation, of enabling it to be kept much longer, is well known. To it no doubt is owing a portion of the stomachic properties of malt liquors, as we see exemplified in the bitter, often called Indian, ales. Hops are Hypnotic, especially when stuffed into a pillow, but they should be first moistened with Spirits to prevent the rustling noise. Fomentations of Hops have been used. The Lupulinic or Hop glands may be given in doses of from gr. vj.–gr. xij. made up into pills.

INFUSUM LUPULI, B. Infusion of Hop.

Prep.—Infuse for two hours in a covered vessel *Hops* ℥ß in boiling *Aq. dest.* Oß. Strain.

Action. Uses.—Tonic, slightly Narcotic, in doses of f℥jß.

TINCTURA LUPULI, B. Tincture of Hop.

Prep.—B. *Hops* ℥ijß, *Proof Spirit* Oj. Prep. as Tinct. Aconiti.
(In the E. and D. P. this tincture was prepared from the Lupulinic glands.)

Action. Uses.—The Tincture of the glands is superior in efficacy to the other. The East Kent Hops contain a larger proportion of glands than the Sussex Hops. Rectified Spirit is also the best dissolvent of the Hop glands.

Dose.—fʒß–fʒij.

EXTRACTUM LUPULI, B. Extract of Hop.

Prep.—Take of *Hop*, ℔j.; *Rectified Spirit*, Ojß; *Distilled water*, Cj. Macerate the Hop in the Spirit for seven days, press out the tincture, filter, and distil off the spirit, leaving a soft extract. Boil the residual Hop with the Water for one hour, then express the liquor, strain and evaporate by a water bath to the consistence of a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding 140° to a proper consistence for forming pills.

Action. Uses.—Tonic; being bitter, without aroma: in doses of gr. v.–gr. xx.

CANNABIS INDICA, B. Cannabis sativa, *Linn.* var. *C. indica.* Flowering tops of the female plant, from which the Resin has not been removed, dried. (Cultivated in India.) Indian Hemp.

The Hemp appears to be a plant of the Persian region, where it is subjected to great cold in winter, and to considerable heat in summer. It has thus been able to travel on the one hand into

Europe, and on the other into India; so that the varieties produced by climate have by some been thought to be distinct species, the European being called *C. sativa*, and the Indian *C. indica.* The name κάνναβις, by which it was known to the Greeks, seems to be derived from the Arabic *kinnub*, the *canape* of the middle ages, Dutch *kinnup* and *hinnup*, German *hanf*, whence the English *hemp.* Herodotus mentions it as Scythian. Bieberstein met with it in Tauria and the Caucasian region. It is well known in Bokhara, Persia, and abundant in the Himalayas. It seems to have been employed as an intoxicating substance in Asia and Egypt from very early times, and even in medicine in Europe in former times, as we find noticed in Dale (*Pharmacologia*, i. 133) and Murray (*Apparat. Medicaminum*, iv. pp. 608–620), where it is arranged, as in this work, next to the Humulus. It has of late years been brought into European notice by Dr O'Shaughnessy.

The Hemp is a diœcious (occasionally monœcious) annual, from 3 to 10 feet high, according to soil and climate. Root white, fusiform, furnished with fibres. The stem erect; when crowded, simple; but when growing apart, branched even from the bottom, angular, and, like the whole plant, covered with fine but rough pubescence. The leaves are opposite or alternate, on long petioles, scabrous, digitate, composed of from 5 to 7 narrow, lanceolate, sharply serrated leaflets, of which the lower are the smallest, all tapering at the apex into a long entire point. Stipules subulate. *Males* on a separate plant. Flowers in drooping, axillary, or racemose panicles, with subulate bracts. Perianth 5-parted; segments not quite equal, downy. Stamens 5; filaments short; anthers large, pendulous, 2-celled; cells united by their backs, opening by a longitudinal slit. *Females* in a crowded spike-like raceme, with leafy bracts. The perianth consists of a single, small, spathe-like sepal, which is persistent, acuminate, ventricose at the base, embraces the ovary, and is covered with short brownish glands. Ovary subglobular, 1-celled, with one pendulous ovule. Style short. Stigmas 2, elongated, glandular. Nut ovate, greyish-coloured, smooth, covered by the calycine sepal, bivalved but not dehiscing, and enclosing a single oily seed. Seed pendulous. Testa thin, membranous, marked at the apex with a coloured hilum. Embryo without albumen, doubled upon itself. Radicle elongated, turned towards the hilum, and the apex of the nut separated from the incumbent plano-convex cotyledons (by a small quantity of albumen, *Lindley*).

The Indian plant has by some been thought to be a species distinct from the European one; but, like Dr Roxburgh and others, Dr Royle was unable when in India to observe any difference between the plant of the plains and that of the hills of India, nor between these and the European plant. The Indian secretes a much larger proportion of resin than is observable in the European plant; but a difference is observed in this point in India between plants grown in the plains and in the mountains, and also between those grown more or less thickly together. The natives plant them wide apart, to enable them to secrete their full powers. In Europe, the thick sowing, and moister, often dull climate, will prevent the due secretion of the peculiar principles of a plant of the Persian region. But the plants grown in a sunny season, from the great heat and light, ought to be more resinous than usual. It is not without interest to observe that both the Hop and Hemp, belonging to the group *Cannabineæ*, owe their properties to glandular resinous secretions. Dr Royle, in calling attention to the uses of this plant in his *Illustr. of Himalayan Botany*, stated that "the leaves are sometimes smoked in India, and occasionally added to Tobacco, but are chiefly employed for making *bhang* and *subzee*, of which the intoxicating powers are so well known. But a peculiar substance is yielded by the plants on the hills, in the form of a glandular secretion, which is collected by the natives pressing the upper part of the young plant between the palms of their hands, and then scraping off the secretion which adheres. This is well known in India by the name of *churrus*, and is considered more intoxicating than any other preparation of the plant: it is so highly esteemed by many Asiatics as to serve them both for wine and opium: it has in consequence a variety of names applied to it in Arabic, some of which have been translated as 'grass of faqueers,' 'leaf of delusion,' 'increaser of pleasure,' 'exciter of desire,' 'cementer of friendship,' &c. Linnæus was well acquainted with its 'vis narcotia, plantastica, dementens' (anodyna et repellens). It is as likely as any other to have been the *Nepenthes* of Homer." (*l. c.* p. 334.)*

Dr O'Shaughnessy has described in detail the different preparations, as—

1. *Churrus*, the concreted resinous exudation from the leaves, slender stems, and flowers. This is collected in various ways; that of the Himalayas is much esteemed, that of Herat and of Yarkund still more so. For a specimen of the last, Dr Royle was indebted to Dr Falconer.
2. *Ganjah*. Dr O'S. describes it to be the dried hemp plant which has flowered, and from which the resin has not been removed. The bundles are about two feet long, and contain twenty-four plants. In N. W. India the name *Ganjah* is applied to the whole growing plant.
3. *Bang*, *Subjee*, or *Sidhee*, is formed of the larger leaves and capsules without the stalks.

The B. P. describes Indian Hemp as the "tops consisting of one or more alternate branches, bearing the remains of the flowers and smaller leaves and a few ripe fruits, pressed together in masses which are about two inches long, harsh, of a dusky-green colour, and a characteristic odour." Except in the size of the bundles, this corresponds with the *Ganjah* of Dr O'Shaughnessy.

The leaves of common hemp have been analysed, but the analysis requires to be repeated and carefully compared with that of the ndian plant. The properties seem to depend upon the Resin. This

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* In an old Chinese book preserved in the Bibliothèque Nationale at Paris, is stated that a preparation of *Chanvre* or *Mayo* was used in China in the hird century of our era as an anæsthetic. The Hemp plant is esteemed for s intoxicating properties in many parts of the world. Dr Daniell states that is smoked in large quantities by the natives of Congo, Angola, and South frica, being called by them *Dakka* and *Damba*. The same kind of pleasureole excitement is produced by other substances, as by Coffee and Opium; to hich may be added the leaves of *Catha edulis* and *C. spinosa*, which are asticated and drunk in infusion by the Arabs at Aden, under the name of Kat.

is very soluble in Alcohol and Ether, as well as in the fixed and Volatile oils, partially soluble in alkaline, insoluble in acid solutions; when pure, of a blackish-grey colour. (The Yarkund specimen is of a dark blackish-green, another kind is of a dirty olive.) Its odour is fragrant and narcotic; taste slightly warm, bitterish, and acrid. The *Ganjah*, which is sold for smoking chiefly, yields to Alcohol about 20 per cent. of resinous extract, composed of *churrus* and Chlorophyll. The Messrs Smith of Edinburgh state that the whole activity of Indian hemp resides in a peculiar Resin, for which rectified Spirit is the best solvent. It is precipitated by the addition of water to its alcoholic solution,—and proof Spirit will not extract it all.

Action. Uses.—All these preparations are capable of producing intoxication, whether the *churrus* be taken in the form of a pill or with conserve, or the dried leaf be rubbed up in milk and water with a little sugar and spice, or smoked. As a medicine, it was tried by Dr O'S. in Rheumatism, Hydrophobia, Cholera, and Tetanus. In the last, such marked benefit and cures were produced that the Hemp was pronounced an Anticonvulsive remedy of the greatest value. Its general effects are, alleviation of pain (generally), remarkable increase of appetite, unequivocal Aphrodisia, and great mental cheerfulness. Its more violent effects were delirium of a peculiar kind and a cataleptic state. Dr Pereira was among the first to submit it to experiment, but failed in obtaining any results, probably from changes having taken place in the drug. Dr Laurie pronounced it uncertain, and not to be trusted to as a narcotic. Mr Ley, however, found it useful in relaxing spasm and producing sleep, and during its action observed an abatement of pain. Mr Donovan found its power great in temporarily destroying sensation, and subduing the most intense neuralgic pain. Professor Miller, of Edinburgh, considers its virtue to consist in a power of controlling inordinate muscular spasm. Dr Glendinning says that in his hands its exhibition has been followed by manifest effects as a soporific or hypnotic in conciliating sleep, as an anodyne in lulling irritation, as an antispasmodic in checking cough and cramp, and as a nervous stimulant in removing languor and anxiety. The Hemp may be used in the following preparations and doses; but Dr O'S., when in England, found that he was obliged to give as much as 10 or 12 gr., and even more; though in India he considered ½ gr. a sufficient, and 1½ gr. of the Extract a large dose. The Extract made in India, and then imported, has been found to be much stronger than that made over here,—which seems to show that the plant undergoes some injury during the voyage. (Squire.)

EXTRACTUM CANNABIS INDICÆ, B. Extract of Indian Hemp.

Prep.—Macerate *Indian Hemp*, in coarse powder, ℔j., in *Rect. Spirit* Oiv. for seven days, and press out the tincture. Distil off the spirit, and evaporate by a water bath to the consistence of a soft extract. (The D. P. prepared it from *Churrus.*)

Dose.—Gr. ß–gr. j.; sometimes much more.

TINCTURA CANNABIS INDICÆ, B. Tincture of Indian Hemp.

Prep.—Dissolve *Extract* ℥j. in *Rect. Spirit* Oj. (ʒj.=about gr. 1¾ of the extract.)

Dose.—♏x.–fʒj. A drachm or so may be given in Tetanus or Hydrophobia every half-hour, until the paroxysms cease or Catalepsy is induced. Proof Spirit has often been used, which accounts for some of the failures which have been made with this medicine. Its Resin is insoluble in proof Spirit. (*See* p. 642.)

Mr Donovan states that the only preparation to be relied upon is the Tincture of the Resin prepared from properly-collected Hemp.

Tribe *Artocarpeæ.*—Shrubs or trees with white or yellowish milky juice. Leaves alternate, large, convolute. Flowers unisexual, in a consolidated, fleshy receptacle or head, seldom spiked. Ovary 1 or 2 celled, with 1 to 2 styles. Ovule 1, erect, straight. Fruits berried, 1-seeded, often growing together, or in a fleshy receptacle. Embryo without albumen. Radicle superior.—Tropical family, with a few species in higher latitudes. Among them are many secreting acrid principles; some very poisonous, as the *Antiaris toxicaria*, or Upas-tree of Java; but there are also some which yield edible fruits.

MORI SUCCUS, B. Morus nigra, *Linn.* The Juice of the Ripe Fruit. The Common Mulberry. (Cultivated in Britain.) *Monœcia Tetrandria*, Linn.

The Mulberry is the *Μορέα ἢ Συκαμινέα* of Dioscorides and of other Greeks, and is mentioned in Luke xvii. 6, as *συκάμινος*. It has no doubt been known from the earliest times.

Tree of 25 to 30 feet in height. It is often described as watery in juice; but Mr Sievier, at Dr Royle's request, examined it, and found it to contain Caoutchouc. (*Antiq. of Hind. Med.* p. 10.) Leaves alternate, roundish, often lobed, cordate, rather acuminate, coarsely serrated, pubescent. Stipules oblong, deciduous. Flowers monœcious, thickly set, or distinct. Unisexual catkins Perianth 4-lobed; in each the lobes concave. *Male* flowers in a spike. Stamens 4, alternate with the segments of the perianth. *Female* flowers clustered in ovoid catkins. Sepals 4, scale-like, overlapping each other, becoming fleshy. Stigmas 2, linear, glandular. Fruit formed by the accretion of the sepals of the perianth become fleshy, each enclosing a lenticular nucule. Seed pendulous. Embryo curved, in fleshy albumen.—Native of Persia, early introduced into the south of Europe.—Nees von E. 100; St. and Ch. 39.

Mulberries, formed by the lateral aggregation of the several female flowers, constitute an ovoid spurious berry; they are at first reddish, but become of a deep purple colour when ripe, and contain an agreeable subacid juice. They are refrigerant and slightly laxative.

SYRUPUS MORI, B. Syrup of Mulberries.

Prep.—Take of *Mulberry Juice*, Oj.; *Refined Sugar*, ℔ij.; *Rect. Spirit*, f℥iiß. Heat the Mulberry Juice to the boiling point, and when it has cooled filter it. Dissolve the Sugar in the filtered liquid with a gentle heat, and add the Spirit. The product should weigh 3℔ 6oz., and should have the specific gravity 1·33.

Action. Uses.—Refrigerant. Used also for colouring draughts.

Ficus, B. Ficus Carica, *Linn.* The Dried Fruit. (Imported from Smyrna.) The Common Fig. *Diœcia Triandria*, Linn.

The Fig (σῦκον) has been employed in diet and in medicine from very early times.

A small tree. Leaves cordate, often palmately lobed, scabrous above, pubescent beneath. Flowers monœcious, numerous, stalked, and enclosed within a pear-shaped fleshy receptacle, which converges so as to leave only a small orifice at the apex, forming what is commonly called the fruit or Fig, with a few bracteal scales at its base. *Male*—Perianth 3-lobed. Stamens 3. *Female*—Perianth 5-parted. Ovary semi-adnate. Style single. Stigmas 2. Utricle single, covered with the persistent, somewhat fleshy, perianth, and sunk into the fleshy receptacle. Achænium lenticular, hard. Embryo curved, within fleshy albumen.—Native of Asia, long introduced into Europe.—Nees von E. 97; St. and Ch. 154.

Formerly, as in the present day, the process of caprification was practised, to assist the ripening of the fruit. This consists in puncturing the fruit with a sharp instrument covered with oil.

The trunk and branches of the common and other Fig trees abound in a milky, usually acrid juice. This is found also in unripe Figs; but as they ripen, mucilaginous and saccharine matter is produced. The Fig becomes soft, juicy, and of a delicate flavour, in favourable climates. When nearly ripe, they are dried in large quantities in the south of Europe, and are exported to this country. They form also an article of commerce in Asia, being imported into India from Affghanistan and Persia.

Action. Uses.—Figs are dietetical, slightly laxative with those unaccustomed to their use. Chiefly employed as Demulcent; or, heated and split open, applied as Cataplasms.

Pharm. Prep.—Confectio Sennæ.

Contrajerva. Root of Dorstenia Contrajerva, *Linn.*, and probably of other species.

This root is supposed to have been first made known by Monardes; others say that it was first sent by Sir F. Drake to Lecluse, who named it *Drakena radix*. The name signifies *counter-poison.*

There is reason to believe, from the statement of Martius and of others, that several species, as *D. braziliensis*, *Houstoni*, *Drakena*, all yield it. Dr Pereira states that none of the roots of *D. Contrajerva* are met with in commerce.

The Contrajerva root of commerce is imported from Brazil, and probably yielded chiefly by *D. braziliensis*, especially as it resembles it in character. The part which is used is the root, or rootstock, which is præmorse, an inch or two in length, scaly or wrinkled, of a greyish colour externally, paler within, with numerous slender radicles from its sides, as well as one or two long tapering ones from its base. The odour is somewhat aromatic; the taste slightly bitterish, warm, and aromatic. The radicles have less of these sensible properties, which are readily extracted by Spirit, and partially by boiling water. They depend chiefly on a Volatile Oil, Resin, Bitter Extractive, and Starch.

Action. Uses.—Stimulant, Tonic, and Diaphoretic; but little used in the present day, though formerly employed (in the form of *Pulv. Contrajervæ Comp.*) in low states of fever and malignant Exanthemata. It is not now officinal.

Dose.—Of the powder gr. xx.–gr. xl.; or it may be given in infusion.

Tr. *Ulmeæ.* Ovary 2-celled. Seed pendulous. Embryo straight.

ULMI CORTEX, B. Ulmus campestris, *Linn.* The broad-leaved Elm. The dried inner bark. (Indigenous and cultivated in Britain.)

The Elm is supposed to be the πτερέα of Dioscorides.

A tree of 60–80 feet, with rugged bark. Leaves rhomboid-ovate, acuminate, wedge-shaped, and oblique at the base, always scabrous above, downy beneath, doubly and irregularly serrated, sometimes incurved. Branches wiry, slightly corky, when young, light brown and pubescent. Flowers perfect. Perianth bell-shaped, 5-cleft, persistent. Stamens 5. Styles 2. Capsule compressed, oblong, with a broad membranous wing all round, deeply cloven, naked (*Lindl.*) European forests, &c.—Nees von E. t. 104.

The inner bark, which is officinal, should be stripped from the tree in spring, and its epidermis and outer layer of bark afterwards removed. The pieces are broad, thin, tough; taste mucilaginous and slightly bitter. It contains *Tannin*, about 3 per cent.; and a peculiar mucilaginous or gummy principle called *Ulmine.*

Action. Uses.—Demulcent Tonic; thought also to be alterative in Cutaneous affections. Used in decoction in doses of ℥iij.

DECOCTUM ULMI, B. Decoction of Elm Bark.

Prep.—Take of *Elm Bark*, cut in small pieces, ℥ijß; *Distilled Water*, Oj. Boil for ten minutes in a covered vessel, then strain and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.

Dose.—f℥ij.–f℥iv. (A good substitute for Sarsaparilla.)

AMENTACEÆ, *Juss.*

The Amentaceæ are found chiefly in temperate climates, with the exception of Salix, which is more widely diffused. They yield valuable timber, and some hardly less valuable bark, which, on account of its astringency, is used as a medicine, for tanning, and as a dye. The acorns of some of them are employed as articles of diet.

Tribe SALICINEÆ. Flowers all in catkins. Fruit naked, 2-valved, 1-celled, many-seeded. Seeds erect, comose.

SALIX, *Linn.* Willow. *Diœcia Diandria*, Linn.

The bark of different species of Willow (ἰτέα) has been long employed medicinally, and its use has been revived in modern times. The species are numerous, and all difficult to distinguish from each other. But the best practical rule is, "Select those whose barks possess great bitterness combined with astringency." (*Pereira.*)

Three British species—*Salix fragilis*, the Crack Willow, *S. alba*, the White Willow, and *S. Capræa*, the Sallow—were specified in a late edition of the D. P., but they are not at present officinal.

Willow bark will of course vary somewhat according to the species from which it is obtained; but it is thin, flexible, rolling up into a quill, or like shavings, with a brown epidermis, white in the inside; reduced with difficulty to powder, having a slight odour, but a powerfully bitter and astringent taste. Besides the usual constituents of vegetables, it contains *Tannin*, which gives it astringency. Buchner discovered in it the peculiar neutral principle called *Salicine.* From the presence of Tannin, the bark is sometimes used in tanning, and a greenish colour is produced by sesqui-salts of Iron. Water and Alcohol take up its active properties.

Salicine is very bitter, crystallises in white silky needles or laminæ, and has no alkaline reaction. It differs also from the vegetable alkalies in not containing Nitrogen, and not forming salts with acids. It is soluble in 5·6 parts of cold, and in much less of boiling water; soluble in Alcohol, but insoluble in Ether. Sulphuric acid decomposes it, producing a bright-red colour. Heated with Sulph. acid and Bichromate of Potash, it forms Hydruret of Salicyle, and gives off the odour of Oil of Meadow-sweet. This substance (Sl H) strikes a violet colour with the solution of a persalt of Iron. It may be thus detected in the urine of persons who have taken Salicine. Salicine, according to Piria, has the composition $C_{26} H_{18} O_{14}$. It is found in several species of *Salix* and of *Populus;* of the former, in *S. Helix alba*, &c. It may be obtained by acting on a saturated decoction of the bark with Acetate or Oxide of Lead, getting rid of the Lead by means of Sul′ or a current of Sulphuretted Hydrogen gas, then evaporating the solution until the Salicine crystallises, and purifying it with animal charcoal and recrystallisation.

Action. Uses.—Astringent Tonic. Useful as a Stomachic, and even for arresting Agues. It may be given in Infusion (dried bark ℥j. to Aq. Oj.), or in Decoction, in Doses of f℥jß, every two or three hours.

Salicine may be used as a febrifuge in doses of gr. ij.–gr. viij. or even gr. xx., like the Sulphate of Quinine. It has been employed to adulterate the latter. (*q. v.*)

Tribe CUPULIFERÆ. Male flowers in a catkin. Female solitary, or aggregated, or spiked. Perianth adnate to the ovary, with a denticulated limb, sometimes evanescent, surrounded by a coriaceous involucre.

QUERCUS, *Linn.* Oak. *Monœcia Polyandria*, Linn.

Monœcious. Male catkins long, pendulous, lax (fig. 96 *a*). Stamens 5 to 10 (*b*). Perianth (*b*) 5 to 7-cleft. Female flower solitary, with a cup-shaped scaly involucre (*c*, magnified). Stigmas 3 (*c*). Ovary 3-celled, 2 of which are abortive. Nut or acorn 1-celled, 1-seeded, surrounded at the base by the enlarged cup-shaped involucre. (*d*, the young fruit; *e*, the same magnified and cut vertically, that the perianth, ovary, and ovules may be seen; *f*, a cotyledon with the radicle.)

QUERCUS CORTEX, B. Quercus pedunculata, *Willd.* The Common Oak. The dried bark of small branches and young stems. (Britain.)

Species of the Oak (δρῦς of the Greeks, and *allon* of the Bible) have been esteemed for their strength and astringency from the earliest times.

The common English Oak, which by some botanists is named *Q. Robur*, Linn., and by others *Q. pedunculata*, Willd. (fig. 96), has its acorns borne on long peduncles, and is thus distinguished from *Q. sessiliflora*, Salisb. (*Q. Robur*, Willd.), which has its acorns clustered upon a very short stalk or sessile, with leaves on elongated stalks. E. B. t. 1845; Nees von E. t. 92. Dr Lindley states that the timber of this kind is very superior to that of the former; but opinions differ respecting the timber of these species; for medical purposes one is probably as good as the other. Dr Greville states that the characters of the different kinds pass insensibly and completely into each other.

Fig. 96.

QUERCUS PEDUNCULATA, Willd. *Quercus Robur*, Linn. Young branches glabrous. Leaves on short footstalks, cuneately oblong, pinnatifid, slightly pubescent beneath. Leaves oblong, rounded with deep, narrow, somewhat acute sinuses; bases biarticulate, equal. Female catkins on long footstalks. Acorns oblong.—Woods.—E. B. t. 1842; Nees von E. t. 93.

The Oak is stripped of its bark in spring and in the beginning of summer. It is usually in long strips, of a coarse fibrous texture, "covered with a greyish shining epidermis, cinnamon coloured on the inner surface, brittle, strongly astringent," not easily reduced to powder. When deprived of its epidermis, it is of a light-brown colour externally. The odour is faint, but the taste bitter and roughly astringent. Its properties are readily extracted by water and by proof Spirit. Its constituents are Tannin (about 15 per cent.), Gallic acid, Uncrystallisable Sugar, Pectin, Tannates of Lime, of Magnesia, and of Potash, &c. The inner part of the bark contains the largest portion of Tannin, and most in the spring of the year. On account of the presence of this principle, a precipitate takes place with Gelatine, and a blackish-coloured one on the addition of a per-salt of Iron.

Action. Uses.—Astringent; in Gargles, Lotions, and Baths for children; sometimes in doses of gr. xxx.–gr. cxx. of the powder given as a Febrifuge. Applied externally, made into a poultice in flabby ulcers and external Gangrene.

DECOCTUM QUERCUS, B. Decoction of Oak Bark.

Prep.—B. Take bruised *Oak Bark* ℥j¼, *Aq. dest.* Oj. Boil for ten minutes in a covered vessel. Strain. Make up to Oj.

Action. Uses.—Astringent; internally in chronic Diarrhœa; as a Gargle in relaxed Uvula; or as an Injection in Leucorrhœa. It has been recommended for injection into the cyst of Hydrocele.

GALLA, B. Quercus infectoria, *Ollivier.* Excrescences formed by the punctures and deposited ova of the *Diplolepis Gallæ tinctoriæ*, Latr. Gall. *Nutgall.* The Gall Oak.

Galls were known to Hippocrates, and are described by Dioscorides (i. c. 147) under the name κηκις, which the Indo-Persian writers have converted into *fikees.* They are the *afus* of the Arabs, and well known in India by the name of *majoo-phul.* Galls are imported into England from Smyrna, being produced in Asia Minor; also from Aleppo, the produce of the vicinity of Mosul in Kurdistan. They are also imported into England from Bombay (sometimes to the extent of 1000 cwt.), having been first brought there from the Persian Gulf. Mr Wilkinson, of the house of Wilkinson and Jewsbury, states that formerly, when he paid much attention to this trade, he observed that whenever the prices were low at Smyrna, the Galls came from Bombay, and *vice versâ;* but the supply was never abundant from both sources in the same year. They are imported into Bombay from Basra (Bussorah), which is not a great deal farther from Mosul than is Aleppo. These are therefore most probably the produce, like Aleppo Galls, of Kurdistan and of other Persian provinces. Dr Falconer, when travelling in the Punjab, was informed that Galls were produced on the Balloot Oak (*Quercus Ballota*).

Galls are produced on different species of Oak, as well as on some other plants, as the Tamarisk. Aleppo Galls are formed by the female of the above *Cynips* (or Diplolepis) piercing the buds of *Q. infectoria* with its ovipositor, and there depositing its eggs. These, producing irritation, cause the juices of the plant to flow towards the wound, and the subsequent enlargement of the part into the form of a gall round the larva. This, when fully developed, escapes by a hole which it perforates in the gall.

Quercus infectoria, now generally acknowledged to be the species yielding the Galls of commerce, is a small tree or shrub, with a crooked stem, not above 6 to 8 feet high. Leaves on short stalks, 1–1½ inch long, ovate-oblong, with a few coarse mucronated teeth on each side; apex bluntly mucronate, rounded, and rather unequal at the base, smooth, shining on the upper side. Acorn solitary, obtuse, 2 or 3 times longer than its hemispherical scaly cup.—A native of Asia Minor; found by Capt. Kinnier in Armenia and Kurdistan.—Nees von E. t. 94; St. and Ch. 152.

The officinal Gall is more or less cellular, and softer towards the centre. M. Duthiers describes it, when fully developed, as exhibiting several distinct tissues from the surface inwards—1, an epidermis without stomata; 2, a cellular layer containing colouring matter; 3, a layer of spongy cells, with large cavities; 4, a zone of hard, dotted, prismatic cells; 5, a layer of thick polyhedral cells, much dotted, very hard; 6, the internal alimentary mass of soft cells filled with liquid, the outer starchy, the innermost nitrogenous. In this last is the egg, which, when hatched into the maggot, gradually consumes the nucleus of the gall, and finally eats its way out, escaping by a hole.

Galls are stated by the B. P. to be "hard heavy globular bodies, varying in size from half an inch to three-fourths of an inch in diameter, tuberculated on the surface, the tubercules and intervening spaces smooth; of a bluish-green colour on the surface, yellowish-white within, with a small central cavity; intensely astringent." But several varieties of Gall are met with in commerce. Besides the names applied from the places whence they are obtained, the officinal or Levant Galls are distinguished by their physical characters, as into Blue and White Galls. The *Blue Galls* vary in size, and are of a bluish-grey colour. They are gathered before the insect has become perfect, or worked its way out. Some of these are larger, and are called *Green Galls*, from being of a greenish colour. They display on their otherwise smooth surface a number of bluntly-pointed tubercles, which would appear to be the apices of leaves stimulated into unnatural growth. The best are heavy, hard, shining, and break with a short flinty fracture. *White Galls* are so called from being of a lighter colour than the others, but still of a greyish or yellowish hue. They are distinguished by being perforated with a small round hole, that by which the insect had escaped. They are usually less heavy than the others, have a larger internal cavity, and are not so astringent. A third variety, called *Large Mecca Galls*, are sometimes imported from Bussorah. They are also called Dead Sea Apples and *Mala insana*. They are identical with some specimens brought by the Hon. R. Curzon from the Holy Land in 1847. They are spherical in shape, and surrounded about the centre by a circle of horned protuberances. They are astringent like other galls, and when fresh are said to be purple and shining. They are thought to be the produce of a peculiar variety of *Q. infectoria* which grows on the mountains near the Dead Sea. (P. J. viii. 422.)

Peculiar Galls of an irregular shape have now and then been imported from China, where they are known by the name of *Woo-pei-tzee.* They are very astringent, and are supposed by Dr Schenk to be formed by the puncture of the leaves of the *Rhus semialata* Murray (Terebinthaceæ), by a peculiar species of *Aphis.*

Nutgalls are easily reduced to powder, which is without odour, but with a simple and powerful astringent taste. They yield their properties to water, which is the best solvent: also to proof Spirit, and slightly to Alcohol and Ether. From 500 parts Sir H. Davy obtained 185 parts of matter soluble in water, of which he states 130 were Tannin, 31 Gallic acid with a little Extractive, 12 of Mucilage, &c., and 12 of saline and calcareous salts, the insoluble matter consisting chiefly of Lignin. But a larger proportion of Tannin has been obtained by other chemists, as from 30 or 40 to 60, instead of the above 26 per cent. The little colouring matter and large proportion of Tannic acid in Galls makes them particularly valuable to tanners.

[Decoctum Gallæ, L. Decoction of Galls.

Prep.—Boil bruised *Galls* ℥ijß in *Aq. Dest.* Oij. down to Oj., and strain.

Used internally in doses of f℥j.–f℥ij.]

Tinctura Gallæ, B. Tincture of Galls.

Prep.—B. *Galls*, in coarse powder, ℥ijß in *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Astringent, in doses of fʒß–fʒij. Diluted as a Lotion, or for exhibition in cases of poisoning with vegeto-alkalies.

Unguentum Gallæ, B. Ointment of Galls.

Prep.—Mix thoroughly *Galls*, in fine powder, gr. lxxx., and *Benzoated Lard* ℥j.

Astringent to external Hæmorrhoids.

Unguentum Gallæ cum Opio, B. Ointment of Galls and Opium.

Prep.—B. Mix thoroughy *Ung. Gallæ* ℥j., powdered *Opium* gr. xxxij. (About 1 in 14 of Opium.)

Action. Uses.—Astringent and Anodyne application to Hæmorrhoids. Dr Paris suggests dissolving Morphia in Olive Oil, and adding the Ointment of Galls.

Acidum Tannicum, B. Tannic Acid. An acid extracted from Galls.

Tannic Acid, or Tannin, exists in Galls in large quantity, being generally obtained from them, though a constituent of many other astringents, as Oak bark, Catechu, &c.

Prep.—B. Take of *Galls*, in powder, and *Ether*, of each a sufficient quantity. Expose the powdered Galls to a damp atmosphere for two or three days, and afterwards add sufficient Ether to form a soft paste. Let this stand in a well-closed vessel for twenty-four hours, then, having quickly enveloped it in a linen cloth, submit it to strong pressure in a suitable press, so as to separate the liquid portion. Reduce the pressed cake to powder, mix it with sufficient Ether, to which one-sixteenth of its bulk of water has been added, to form again a soft paste, and press this as before. Mix the expressed liquids, and expose the mixture to spontaneous evaporation until, by the aid subsequently of a little heat, it has acquired the consistence of a soft extract; then place it on earthen plates or dishes, and dry it in a hot-air chamber at a temperature not exceeding 212°.

This is the process of Wittstein, who obtains by it from 25 to 50 per cent. of the acid from Galls. The Ether and Water dissolve out the Tannic acid, which is left on evaporation. Any Gallic acid present would be obtained at the same time. In the process of 1864 a mixture of Ether and Water was used, and the liquid, after acting on the Galls, was allowed to stand till it separated into two layers. The lower or watery layer contained the greater part of the Tannic acid. The upper or ethereal layer was to be removed. The Ether could be recovered from this by distillation. Oak Galls, until they have been fermented, contain but a trifling proportion of Gallic acid.

It is the type of Astringents. Ordinary Tannin is amorphous, brownish-coloured, and consists of impurities united to the Tannic acid. Tannin or Tannic acid is, when pure, white, but usually has a yellow tinge, is spongy, shining, without odour, but extremely astringent. It is very soluble in water and in weak Spirit, very sparingly in Ether; it has an acid reaction. When heated, it swells up, and is decomposed, leaving a bulky charcoal. It precipitates Gelatine (yellowish-white) from its solutions; combines with the Gelatinous parts of skin, and thus forms leather. It forms precipitates (Tannates), most of which are nearly insoluble, with most metallic oxides, and likewise with alkalies and their Carbonates, including vegetable alkalies. The mineral acids, combining with the Tannic, also form precipitates in concentrated solutions. With sesqui-salts of Iron it is well known to form a bluish-black precipitate (ink); the Tannin of Sumach, Catechu, &c., as has been frequently mentioned, forms a very dark-green precipitate with the same salts; no effect is produced on the Proto-salts of Iron. M. Strecker has lately shown that Tannic acid is a complex body, which, when acted on by alkalies or ferments, is capable of uniting with the elements of water to form Gallic acid and Glucose. He finds its composition to be $C_{54} H_{22} O_{34}$.

GLYCERINUM ACIDI TANNICI, B. Glycerine of Tannic Acid.

Prep.—Take of *Tannic Acid* ℥j., *Glycerine* f℥iv. Rub them together in a mortar, then transfer the mixture to a porcelain dish, and apply a gentle heat until complete solution is effected.

Introduced in 1867. An admirable astringent application to Piles, relaxed uvula, bleeding or inflamed surfaces.

SUPPOSITORIA ACIDI TANNICI, B. Tannin Suppositories.

Prep.—B. Take of *Tannic Acid*, gr. xxiv.; *Glycerine*, ♏xx.; *Prepared Lard*, a sufficiency; *White Wax*, a sufficiency. Melt eighty grains of the Lard and forty grains of the Wax in a water bath, and, when nearly cold, add the Tannic

Acid previously well mixed with the Glycerine. When the mixture has solidified, divide the mass into twelve equal portions, to be formed into cones, which are to be allowed to stand till they acquire sufficient firmness. Dip each cone into a mixture of three parts of the Wax and eight of the Lard, kept melted in the water bath, and set aside in a cool place, that the coating may become hard.

Action. Uses. — Topical application in Dysentery, Chronic Diarrhœa, Piles, Bleeding, or relaxation of the lower bowel.

TROCHISCI ACIDI TANNICI, B. Tannin Lozenges.

Prep.—B. Take of *Tannic Acid*, gr. ccclx. ; *Tincture of Tolu*, f℥ß ; *Refined Sugar*, in powder, ℥xxv. ; *Gum Arabic*, in powder, ℥j. ; *Mucilage of Gum Arabic*, f℥ij. ; *boiling Distilled water*, f℥j. Dissolve the Tannic Acid in the Water ; add this solution to the Tincture of Tolu, previously mixed with the Mucilage ; and with the Gum and the Sugar, also previously well mixed, form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.

Each lozenge contains half a grain of Tannic Acid. *Dose.*—gr. x.–gr. xx. daily.

ACIDUM GALLICUM, B. Gallic Acid. A crystalline acid prepared from Galls.

Prep.—B. *Galls* in coarse powder, ℔j. ; *Distilled water*, a sufficiency. Place the Galls in a porcelain dish, pour on as much of the Water as will convert them into a thick paste, and keep them in this moistened condition for six weeks, at a temperature of between 60° and 70°, adding Distilled water from time to time to supply what is lost by evaporation. At the end of that time boil the paste for twenty minutes with forty-five fluid ounces of the Water, strain through calico, and when the fluid has cooled collect on a filter the crystalline deposit which has formed, and let it drain. Press it strongly between folds of filtering paper, and redissolve in ten ounces of boiling Distilled water. When the fluid has cooled to 80° pour it off from the crystals which have formed, wash these with three ounces of ice-cold Distilled water, and dry them, first by filtering paper, and finally by a temperature not exceeding 100°. By boiling the undissolved portion of the galls with forty-five additional ounces of water, filtering into a capsule containing the liquor decanted from the crystals in the preceding process, evaporating to the bulk of ten ounces, and cooling to 80°, an additional quantity of acid may be obtained, which, however, is usually a little darker in colour than the product of the previous crystallisation.

By the exposure to the air the Tannin is gradually oxidised, and Gallic acid formed. This is extracted by the boiling water, and deposited by it on cooling, being comparatively insoluble. Any Tannic acid undecomposed is left in the mother-liquor.

The result of this process is described by the B. P. as in acicular prisms, sometimes white, but generally of a pale fawn-colour, soluble in about 100 parts of cold water, 3 parts of boiling water, soluble also in rectified Spirit. It gives a bluish-black precipitate with a persalt of Iron. It leaves no residue when burned with free access of air. Its solution gives no precipitate with gelatine.

The equivalent of Gallic acid is $C_7 H_3 O_5 + H O$, or $C_{14} H_3 O_7 + 5 H O$. It is colourless and crystalline, with an acid and styptic taste. It is soluble in water, alcohol, and ether. It causes a dark colour with a solution of a persalt of Iron. But it differs from Tannic acid in being unable to precipitate gelatine, or albumen, or the vegetable alkaloids. It is therefore of no use in tanning. Externally applied, it is not nearly so astringent as Tannic acid, but internally it is equally efficacious, and may be given in a smaller dose. It is thought probable that it combines with something in the system which enables it to act *internally* in the same manner as Tannic acid *externally*. (Headland.) Gallic acid is usually met with as a yellowish crystalline powder.

Though Galls are stated by Sir H. Davy to contain only about 6 per cent., and by Pelouze only 3, of this acid, a much larger quantity may be obtained from them, because it is formed by the conversion of the Tannic′ into Gallic acid by the absorbing of oxygen from the atmosphere, Carbonic′ being given off.

Action. Uses.—Galls are powerfully Astringent; though seldom given internally. Dr Royle frequently prescribed from 10 to 20 gr. of the powder several times a-day, or in Infusion, in the obstinate chronic Diarrhœas of the natives of India. The natives themselves prescribe them in Intermittents. The tincture is much used as a test for the salts of Iron. An infusion may be employed as a Gargle, Wash, or Injection, or as an antidote to poisoning by vegeto-alkalies, but the diluted Tincture affords a more ready antidote.

Tannic and Gallic acids are the best astringents with which we are acquainted. For external application, as a styptic, &c., the former is the best. For internal use, as in Hæmaturia, Hæmoptysis, profuse Sweating, &c., Gallic acid is preferable. It is given in doses of gr. iij.–gr. x. three times a-day.

GLYCERINUM ACIDI GALLICI, B. Glycerine of Gallic Acid.

Prep.—Take of *Gallic acid* ℥j., *Glycerine*, f℥iv. Rub them together in a mortar, then transfer the mixture to a porcelain dish, and apply a gentle heat until complete solution is effected.

Introduced in 1867. Of little use as a topical application, as Gallic acid (*see* above) is scarcely an external astringent.

BALSAMACEÆ, *Lindl.*, contains the genus *Liquidambar*, of which one species, *L. Styraciflua*, is indigenous in North America. This yields in Mexico and Louisiana a liquid balsam of an aromatic odour and taste, containing Styracine and Benzoic acid. Dr Pocock found *L. orientale* in Cyprus, where it was called *Xylon Effendi*, the tree of our Lord. It has been proved that this yields the liquid Storax of commerce (*see* Styrax, p. 541). The Liquid Balsam, under the name of *Rose Maloes* and *Rosa Mallas*, makes its appearance in the accounts of the commerce of the Red Sea and Persian Gulf. Petiver, as quoted by Dr Lindley, stated that the tree which yielded it was the *Rosa Mallas*, and grows in Cobross, an island at the upper end of the Red Sea, near Cadess, which is three days' journey from Suez. It is sent in barrels by Bay of Jidda to Mocha. This has been supposed by some to be yielded by *Liquidambar Altingia* of Blume, a native of Java, which is there called *Ras-sa-mala*, and undoubtedly yields the fine liquid Storax or *Rosamala* of the Malayan Archipelago.

(*Lindley.*) But Dr Pereira has ascertained that all the liquid Storax imported for the last seven years comes from Trieste. He also states that the strained Storax (*Styrax colatus*) sold to the perfumers is prepared from this variety of liquid Storax.

GYMNOSPERMÆ, *Lindl.* Gymnosperms.

This division has been made of some Exogens, in consequence of their ligneous tissue being dotted with disk-like marks, and their ovules being truly naked, so as to be fertilised directly through the foramen of the ovule.

The CYCADEÆ form a small family somewhat resembling Palm trees in appearance, and were at one time thought to be allied to them and to Ferns. By Mr Brown they have been shown to be most closely allied to Coniferæ.

A kind of Sago is said to be procured from the cellular substance occupying the interior of the stem of *Cycas revoluta*, a native of Japan, and also of *C. circinalis.* Both exude a clear insipid mucilage, which hardens into a firm transparent gum, like Tragacanth, but clearer. Dr Roxburgh was unable to ascertain that any of the species yielded Sago, or a substitute for it, though species of Cycas were quoted as yielding Sago in the E. P., and *C. circinalis* by the D. P.

Dr Lindley states that one of the best kinds of Arrowroot is prepared in the Bahamas from the trunk of some species of Zamia, which is a native of the West India Islands.

CONIFERÆ, *Juss.* Conifers.

Yield valuable timber, as Deal, Cedar, &c., and most of the species exude Turpentine, which is a compound of Resin and Volatile Oil.

The products of Coniferous plants officinal in the Pharmacopœias are so numerous, are obtained from so great a variety of sources, and are yet so similar to each other, that it is hardly possible to refer them all with correctness to their respective plants. It is preferable, therefore, as has been done by Dr Pereira and in Duncan's *Edinburgh Dispensatory*, first to enumerate the several Pine trees which are supposed to yield these products, and then to treat of the products themselves,—of natural Turpentine, of Resins of different kinds, and then of those obtained with the aid of heat, as Oil of Turpentine, Tar, and Pitch.

PINUS, *Linn.* Pine. *Monœcia Monadelphia*, Linn.

Flowers monœcious. *Males*—Catkins racemose. Filaments short. Anthers crested, 2-celled, bursting longitudinally (or stamens 2, anthers 1-celled). *Females*—Catkins solitary, or from 2 to 3. Scales imbricated, with membranous bractlets. Ovules 2, at the base of the scales, collateral, inverted, their points lacerated and directed downwards. Scales of the cone hard, woody, and truncated, hollowed at the base for the reception of the seeds. Seeds prolonged at the base into a membranous wing. Leaves evergreen, usually acicular, in fascicles, surrounded at the base by a membranous tubular sheath.

PINUS SYLVESTRIS, *Linn.* Scotch Fir. Red Deal. Leaves in pairs. Young cones stalked, recurved, ovate-conical. Wing thrice as long as the seed.—

Lamb. Pin. t. 1; Nees von E. t. 79.—Scotland, Norway, woods of Europe, north of the Alps.—This species yields much Turpentine, Pitch, and Tar, though at present little of it is imported into this country.

P. MARITIMA, *Dec.* (*P. Pinaster* of Lambert), Nees von E. t. 76, 77, is abundant on the southern coasts of Europe, as well as of England, and in the south of France in the department of the Landes. It yields Bourdeaux Turpentine, Galipot, Pitch, and Tar.

P. PALUSTRIS, *Lambert.* The Swamp Pine and Long-leaved Pine. A large tree, distributed from the southern States of Virginia to the Gulf of Mexico. "This tree furnishes by far the greater proportion of Turpentine, Tar, &c., consumed in the United States, or sent from them to other countries."—*Wood and Bache.*

P. PINEA, *Lamb.*, and *P. Cembra*, the Siberian Stone Pine, are interesting, as the seeds of both, sometimes called *Pine-nuts*, are eaten, as are those of *P. Geradiana*, in Affghanistan and Tibet. *P. longifolia*, Lamb., is a Himalayan species, which yields a very fine Turpentine, resembling pure white granular honey; much used by the natives of India in medicine, and called *bireeja*, &c.

ABIES, *Tourn.* Fir.

Monœcious. *Males*—Catkins solitary. Anthers bursting transversely. *Females*—Catkins simple. Scales (or carpels) imbricated, thin at the apex, rounded, flat, instead of being hollowed for the seeds; when ripe, falling from the axis. Leaves solitary in each sheath, never fascicled. In other respects agreeing with Pinus.

ABIES EXCELSA, *Dec.* (*Pinus Abies*, Linn.) Norway Spruce Fir.—Leaves scattered, tetragonal. Cones cylindrical, pendulous; the scales rhomboidal, flattened, jagged, and bent backwards at the margin.—Northern parts of Eastern Europe, Alps, northern parts of Asia and America.—Nees von E. t. 80. Yields Abietis Resina by spontaneous exudation.

A. Picea, Lindl. The Silver Fir, with distichous leaves and erect cones. A native of the mountains of Central Europe. Yields Strasburg Turpentine.

A. BALSAMEA, *Marsh.* (*Pinus balsamea*, Linn.) Canadian Balsam and Balm of Gilead Fir. Leaves solitary, flat subpectinate, suberect above. Acuminate apex of the scales of the cone when in flower reflexed.—Northern parts of North America.—Lamb. Pin. t. 41 Nees von E. t. 82.

A. canadensis, Lindl. Hemlock Spruce Fir is said to exude a Turpentine similar to that of the foregoing. *A nigra* the Black Spruce Fir is interesting as yielding the Essence of Spruce.

LARIX, *Tourn.* Larch.

Monœcious. Catkins and cones lateral. *Males*—Catkins simple, ovate. Anthers numerous, with their filaments united into a thick column. Anthers crested, bursting longitudinally. Leaves, when first expanding, in tufted fascicles, becoming somewhat solitary by the elongation of the new branch.

LARIX EUROPÆA, *Dec.* (*Abies Larix*, Lam.; *Pinus Larix*, Linn.) The Larch is a lofty tree, with wide-spreading branches; when well grown, the extremities droop gracefully. The leaves deciduous. Flowers reddish. Cones ovate-oblong. Edges of scales reflexed, lacerated. Bracts panduriform. (*Lambert.*) —Nees von E. 83; St. and Ch. 75.—A native of the Alps, much cultivated in this country. Yields Venice Turpentine, and a kind of manna called "Manna de Briançon."

Larix (or Cedrus) *Deodara* (Deodar and Kelon), the Himalayan Cedar, is an elegant and lofty tree, hardy as the Larch, and yielding valuable timber. It has been extensively introduced into this country by the East India Company, and is interesting as having been long employed in medicine by the Hindoos, and known even to Avicenna. (*Hindoo Med.* 36.) Its Turpentine, known by the name *kelon-ke-tel*, is in great repute in the North-West of India, from its stimulant properties and power of healing deep-seated ulcers, as in elephants and camels.

1. *Turpentines: natural Oleo-resins of Coniferæ.*

(*A. Fluid Turpentines.*)

TEREBINTHINA. Pinus palustris, Pinus Tæda, Pinus sylvestris, Pinus maritima, Abies excelsa, Abies balsamea, Larix europæa, &c. Fluid Resinous exudation. Turpentines.

Turpentine exudes naturally or from incisions from most trees of the Pine tribe, as also from *Pistacia Terebinthus* (p. 380). It consists of Resin intimately mixed with a Volatile Oil, known in its separated or distilled state as Oil of Turpentine. In time, all Turpentines become converted into Resins, from the evaporation of the Oil, and by its oxidation. They all soften by heat, burn readily, are soluble in Alcohol and Ether, unite with the fixed Oils, and resemble each other very closely in taste and smell; but differ in being more or less white or dark-coloured, and in the odour and taste being more or less agreeable. Water acquires only a little of their properties, but they may be made into an emulsion with eggs or vegetable mucilage.

Common Turpentine used to be procured from *Pinus sylvestris*, as it still is in many parts of Europe, and also from *P. maritima*, which yields the Bourdeaux Turpentine, and in winter the *galipot* of the French. But Dr Pereira has shown that almost the whole quantity of Turpentine imported here is from America. This is procured chiefly from *P. palustris*, partly also from the *P. Tæda*, as stated by the B. P. It is generally obtained by removing a portion of the bark, hollowing out a cavity below it in the wood, and allowing the Turpentine to exude into this. This Turpentine is viscid, semifluid, of a dull light yellowish colour, with a warm, acrid, rather bitter taste, and a moderate terebinthinate odour. When fresh, it yields 17 per cent. of Oil of Turpentine. (*W.* and *B.*) The Bourdeaux Turpentine is whitish, turbid, separates upon standing into a transparent liquid and into a granular honey-like semifluid. It is acrid and nauseous in taste, of a disagreeable smell, and yields about 20 per cent. of Oil. M. Faure discovered that it might be solidified by the aid of a 32d part of Magnesia. Common Turpentine yields Oil of Turpentine and Resin (q. v.)

TEREBINTHINA VENETA. Fluid Resinous exudation of *Larix europæa*. Venice Turpentine. This, when genuine, is a thick tenacious fluid, usually of a cloudy appearance, of a yellowish-green tint, acrid and bitter in taste, and of a strong peculiar odour. It is obtained from Italy, Switzerland, and the Alps. It is sold in Paris as Strasburg Turpentine, and is distinguished by being less liable than others to solidify. (*Guibourt and Pereira.*) Dr Thomson stated long since that the Venice Turpentine of the shops was imported from America. This is probably a factitious preparation.

What is usually sold for Venice Turpentine is a mixture of Oil of Turpentine with common Resin.

Terebinthina Canadensis, B. Fluid Resin of *Abies balsamea.* Canada Balsam is procured by breaking the vesicles which naturally form upon the trunks and branches, and then collecting their fluid contents, or by incisions from the stem. It is often called Balm of Gilead. When fresh it is nearly colourless, of a light yellow colour, transparent like thin honey; solidifies slowly; is of a strong, rather agreeable odour, and a bitterish, rather acrid taste. Strasburgh Turpentine is sometimes substituted for it. It is used in the B. P. in making Flexible Collodion and Blistering Paper.

(*B. Concrete Turpentines.*)

Abietis Resina. Resin of *Abies excelsa.* Frankincense.

Thus Americanum, B. From *Pinus Tæda* and *Pinus palustris.* (Southern States of North America.) American Frankincense.

The Resin of the Norway Spruce Fir may be arranged with the Turpentines as being a spontaneous exudation, and with the Resins as having lost by evaporation most of its Volatile Oil. It is one kind of *Thus,* or Frankincense. It is obtained from Europe, and from Canada. It is collected in the form of concrete tears, which are hard and brittle, but soften readily at the temperature of the body. It is of a light yellowish or brownish-yellow colour externally, lighter within; slight terebinthinate odour, and acrid bitter taste.

The substance which the French call *galipot* or *barras* is the concretion produced on the Pine of the Landes, late in the year or in winter, when the collection of Bourdeaux Turpentine has ceased.

American Frankincense (officinal in the B. P.) is the solidified *Terebinthina* of *P. palustris* and *P. Tæda.* A very fine Resin is yielded spontaneously by the Himalayan *Pinus Morinda,* Royle.

Pix Burgundica, B. Burgundy Pitch is the Resin of *Abies excelsa* melted in water immediately after being scraped from the tree and strained through a cloth. It is thus freed from mechanical impurities, with a loss of a little of its Volatile Oil. It is imported from Switzerland. But much of that which is sold is a factitious compound of Resin rendered opaque by the incorporation of water, and coloured by Palm Oil, or made from concrete American Turpentine. (*Pereira.*)

Burgundy Pitch is used to make the following Plaster, also, Emp. Ferri.

Emplastrum Picis, B. Burgundy Pitch Plaster. Warm Plaster.

Prep.—B. Take of *Burgundy Pitch,* ℥xxvj.; *Common Frankincense,* ℥xiij.; *Resin,* ℥ivß; *Yellow Wax,* ℥ivß; *Expressed Oil of Nutmeg,* ℥j.; *Olive Oil,* f℥ij.; *Water,* f℥ij. Add the Oils and the Water to the Frankincense, Burgundy Pitch, Resin, and Wax, previously melted together; then constantly stirring, evaporate to a proper consistence.

Action. Uses.—Warm Rubefacient Plaster to the chest and joints, &c.

II. *Resin and Oil prepared from crude Turpentines.*

Resina, B. Residue of the distillation of the Volatile Oil from Turpentines of various species of *Pinus* and *Abies*.

When any of the Pinic Turpentines are subjected to distillation with or without water, the Volatile Oil rising as soon as they are much heated, leaves behind a solid Resin, which is often called Colophony (Fr. *Colophane*), from the Greek *κολοφονία*, but usually Black Resin, though it is only of a brownish-yellow colour, transparent, and a little empyreumatic. When the distillation is not carried quite so far, or if more water is added during the process, and agitated with it while in fusion, some of it becomes incorporated with the Resin, which is rendered opaque, or of a whitish colour. This is the *Resina* of the Pharmacopœia, or *Yellow*, sometimes called *White Resin.* The incorporated water escapes by evaporation, or may be expelled: the Resin then becomes of a pale yellow colour and transparent.

Resin is solid and transparent, very brittle, with a glassy fracture; is a little heavier than water; differs in colour according to its purity; has a weak terebinthinate odour and taste; melts at a moderate heat, becomes decomposed at a higher, producing both an oil and a gas; and burns with a smoky flame. It unites when in fusion with Wax, fats, and fatty oils, also Spermaceti; is readily dissolved by Alcohol, Ether, and many volatile oils; and is insoluble in water. The strong acids decompose it: the alkalies unite with it, and form soaps. Instead of being simple, it is chiefly a compound of two acid bodies, one called *Sylvic*, the other *Pinic acid.* Besides these, it contains a third acid, *Colophonic*, formed by the action of heat upon *Sylvic*, and a trace of a neutral resinous substance. The *Sylvic* acid is more soluble in cold and diluted Alcohol, and may thus be separated from the two others. It crystallises in small, quadrangular, rhombic prisms, is colourless, insoluble in water, soluble in Ether, in strong hot Alcohol, and in volatile oils. *Pinic acid* ($C_{20}\,H_{15}\,O_2$) is isomeric with Sylvic, and has many of the same properties. *Colophonic acid* is of a brown colour, and sparingly soluble in Alcohol.

Action. Uses.—Mild Stimulant; used externally, but chiefly on account of its adhesive properties, in various Cerates, Unguents, and Emplastra.

Emplastrum Resinæ, B. Resin Plaster. (*See* Plumbi Oxidum.)

Unguentum Resinæ, B. Ceratum Resinæ, L. Resin Cerate, or Basilicon Ointment.

Prep.—B. Take of *Resin*, in coarse powder, ℥viij.; *Yellow Wax*, ℥iv.; *Simple Ointment*, ℥xvj. Melt with a gentle heat, strain the mixture while hot through flannel, and stir constantly until it cools.

Action. Uses.—A mild Stimulant, applied to foul or indolent ulcers.

OLEUM TEREBINTHINÆ, B. Oil distilled from the Oleo-resin or Turpentine of *Pinus palustris*, *P. Tæda*, and sometimes *P. Pinaster*. (B.) (Imported from America and France.) Oil of Turpentine.

Oil of Turpentine, separated from the Resin by the process of distillation, is found swimming on the surface of the water with which it is distilled, and is not observed to differ materially when obtained from different Pine trees. Dr Royle, when in India, distilled the Oil from the Turpentine of *Pinus longifolia*, which, when sent to the General Hospital at Calcutta, was pronounced to be "of very superior quality." Dr Pereira found that American Turpentine is now chiefly employed for obtaining the Oil, which it produces at the rate of about 14 to 16 per cent., and that the Bourdeaux Turpentine yields an inferior Oil and Resin.

Ol. Terebinthinæ is prepared by distilling Turpentine with water in a copper alembic. Yellow Resin remains behind. The rectified Oil is obtained by redistilling the commercial Oil, as in the following formula.

Prep.—Cautiously distil *Oil of Turpentine* Oj., with *Aq.* Oiv. as long as oil comes over with the water. Mr Flocton redistils from a solution of caustic Potash, to get rid of all traces of resinous and acid matters. (*Per.*)

This purified Oil is limpid, colourless, with a powerful penetrating odour, and pungent bitterish taste. Sp. Gr. 0·865; boils at about 312°, but, as volatilisation proceeds, at 350°. Sp. Gr. of its vapour 4·764. It is very inflammable, producing much black smoke. It is slightly soluble in water, more readily in Ether and in Alcohol; miscible in all proportions in the fixed oils; dissolves resins and fats, and is one of the few solvents of Caoutchouc. When moist and exposed to great cold, it deposits crystals, which are a Hydrate of the Oil. Sul′ chars it, Nit′ and Chlorine set it on fire. It absorbs H Cl acid gas, and a substance called *artificial Camphor* ($C_{20}H_{16}$, H Cl) is produced. The composition of Oil of Turpentine is $C_{20}H_{16}$. When exposed to the air, it absorbs Oxygen, by which Resin is produced: therefore Oil which has been long kept usually contains some. Oil of Turpentine is supposed to consist of two very similar and isomeric oils, one of which forms a solid Camphor with H Cl, the other a liquid Camphor. These two oils have been named *Camphene* and *Terebene.*

Action. Uses.—Rubefacient and Counter-irritant when applied externally. Stimulant when taken internally, acting as a Diuretic and Diaphoretic; in large doses, as a Cathartic; useful as an Anthelmintic. For this purpose, and to act as a Cathartic, it is sometimes conjoined (fʒij.) with a little Castor Oil (fʒvj.) Its action is, however, somewhat uncertain. It sometimes produces dangerous congestion of the kidneys, evidenced by strangury or total suppression of urine. Occasionally, intoxicating effects are produced by large doses. In doses of ♏viij.–fʒß frequently repeated, it acts as a Stimulant, becomes absorbed, and is exhaled both by the skin and lungs, while the urine acquires a violet odour. In large doses (fʒiv.–fʒij.) it acts as a Cathartic, and its irritant effects, as those of Strangury, are not perceived, from absorption not having taken place.

It should be made into an emulsion with the yolk of one egg for every fʒij., and diluted to the patient's taste, with water, plain or aromatised. (*c.*)

Confectio Terebinthinæ, B. Turpentine Confection.

Prep.—Rub *Oil of Turpentine* f℥j. with powdered *Liquorice Root* ℥j., then add *Clarified Honey* f℥ij., and beat them to a uniform consistence.

Dose.—ʒß–ʒiv.; used as an Anthelmintic.

Linimentum Terebinthinæ, B. Turpentine Liniment.

Prep.—B. Dissolve *Camphor* ℥j. in *Oil of Turpentine* ℥xvj., add *Soft Soap* ℥ij. Rub together until thoroughly mixed.

Action. Uses.—Stimulant Liniment, but chiefly used by applying lint soaked in it to burns and scalds. (*Dr Kentish.*)

Linimentum Terebinthinæ Aceticum, B. Liniment of Turpentine and Acetic acid.

Prep.—Take of *Oil of Turpentine*, f℥j.; *Acetic acid*, f℥j.; *Liniment of Camphor*, f℥j. Mix.

Unguentum Terebinthinæ, B. Ointment of Turpentine.

Prep.—Take of *Oil of Turpentine*, f℥j.; *Resin*, in coarse powder, gr. lx.; *Yellow Wax*, ℥ß; *Prepared Lard*, ℥ß. Melt the ingredients together by the heat of a steam or water bath. Remove the vessel, and stir until the mixture becomes solid.

Enema Terebinthinæ, B. Turpentine Enema.

Prep.—B. Mix *Oil of Turpentine* f℥j. with *Mucilage of Starch* ℥xv.

Action. Uses.—Antispasmodic; Anthelmintic in cases of Ascarides.

III. *Empyreumatic products of Coniferous trees.*

Pix liquida, B. Pinus sylvestris, *Linn.*, and other species. A bituminous liquid, obtained from the wood by destructive distillation. Tar.

Tar has been employed in medicine from very early times. It is imported into this country both from the north of Europe and from North America. It is prepared by submitting the roots and branches of different Pine trees to a smothered combustion. The resinous matter is melted and altered by the heat, and the Tar flows out as a viscid and tenacious fluid, of a brownish-black colour, having a bitter, resinous, and slightly acid taste, and an empyreumatic odour. It is a very complex mixture of Resin and Oil of Turpentine, both modified (forming *Pyretine* and *Pyroleine*), some Charcoal, and Pyroligneous acid, with various products of the destructive distillation of the wood. By subjecting it to distillation, Oil of Tar and Pyroligneous acid are obtained, and Tar-water is made by agitating it with water. Tar is soluble in Ether, Alcohol, and the fixed and volatile oils. Several kinds of it yield *Creosote*, *Paraffine*, *Eupion*, &c., when the liquid parts are evaporated; and Pitch is left.

Action. Uses.—Tar, taken internally, is an Alterative Stimulant, and especially recommended in Lepra; applied externally it promotes a healthy action in indolent ulcers, and in some cutaneous diseases. The vapour is sometimes inhaled in chronic bronchial affections.

Dose.—Gr. lx.–℥ß daily.

Tar-water, holding Creosote and other matters in solution, was considered by Bishop Berkeley to be a panacea for most diseases, but is now never used. "Water agitated with Tar acquires a pale-brown colour, sharp empyreumatic taste, and acid reaction."

UNGUENTUM PICIS LIQUIDÆ, B. Tar Ointment.

Prep.—B. Melt *Yellow Wax* ℥ij. with a gentle heat, add *Tar* ℥v., and stir briskly till cool.

Action. Uses.—Stimulant. Useful in Ringworm, Lepra, and some ulcers. (Introduced in 1867, from the L. P.)

[PIX, L. (*Pix nigra.*) Bitumen aridum e Pice liquidâ comparatum. Pitch.

Pitch is left after the distillation of the liquid parts of the Tar. It is well known for its black colour and firm texture, and consists of many of the same constituents as Tar.

Action. Uses.—Stimulant and Alterative. Used in Ichthyosis, &c., in doses of gr. x.–gr. lx. in pills.

UNGUENTUM PICIS, L. Pitch or Black Basilicon Ointment.

Prep.—Melt together *Black Pitch, Wax, Resin*, āā ℥xj.; *Olive Oil*, Oj. Express through linen.

Action. Uses.—Stimulant application to Porrigo, Leprous Eruptions, and indolent ulcers.]

Tribe, *Cupressineæ.*

Flowers diœcious, rarely monœcious, upon different branches. *Males*—Catkins axillary or subterminal, ovate, small. Anthers 4-7, 1-celled, inserted on the lower edge of the subpeltate scales. *Females*—Flowers few, in an axillary ovate catkin, imbricated, with bracts at the base, lower ones barren. Scales 3-6, united at the base, and containing usually 3 ovules, which are erect, perforated at the apex. Fruit a galbulus, consisting of the scales become succulent, and consolidated into a drupe-like body. Seeds osseous, triquetrous.

JUNIPERUS, *Linn.* *Diœcia Monadelphia*, Linn.

JUNIPERUS. Juniperis communis, *Linn.* Tops and Berries. Juniper.

The Juniper (ἄρκευθος) was employed by the Greeks, and subsequently by the Arabs, being their *abhool.* Species are mentioned in the Bible (*see* Bibl. Cycl.)

The Juniper forms a bushy shrub. Branches smooth and angular towards their extremities. Leaves evergreen, 3 in each whorl, crowned, linear, subulate, channelled, stiff and sharp-pointed, longer than the galbulus, of a shining green colour on their lower surface, but having a broad glaucous line along the centre of the upper, which is resupinate. Flowers axillary, sessile, the males discharging much yellow pollen. Females on a separate shrub, green, on scaly stalks. The fruit ripens in the autumn of the second year.—A native of the northern parts of Europe, Asia, and America.—Nees von E. 86; St. and Ch. 141.

All parts of this plant when bruised exhale a more or less agreeable terebinthinate odour. The wood is officinal on the Continent; the tops and fruits are used in this country. The latter are imported from the north, but the best come from the south of Europe. They are globular, marked with three radiating furrows at the summit and below by the bracts; are of a purple-black colour with a glaucous bloom, and contain a brownish-yellow pulp. Their taste is sweetish, followed by bitterness, slightly terebinthinate, as is the odour, and somewhat aromatic. These properties are imparted partly to water and readily to Alcohol, depending on the presence of Volatile Oil (q. v.) 1 per cent., Wax 4, Resin 10, Gum 7, Grape Sugar with Salts of Lime, 33·8, the remainder being Lignin and water = 100.

Action. Uses.—Berries Stimulant, Diuretic; but seldom used. Largely employed in the manufacture of Hollands Gin.

OLEUM JUNIPERI, B. Oil of Juniper. (Distilled in England from the unripe fruit.)

Oil is obtained from the fruits (and other parts of the plant), by distillation with water. It is colourless, or of a light green tinge, lighter than water, corresponding very closely with the Oil of Turpentine, like it little soluble in Alcohol. Like it, also, it is supposed to consist of two isomeric oils, the formula of each being $C_{20}\ H_{16}$. It has the odour of the fruit, and a warm aromatic taste.

Action. Uses.—Stimulant, Diuretic. Considered very certain in its effects in doses of ♏iv.-♏vj. Its effects may be assisted by combination with Spirit of Nitre and with Digitalis. Hollands Gin owes its Diuretic properties to the presence of this Oil.

SPIRITUS JUNIPERI, B. Spirit of Juniper.

Prep.—B. Dissolve *English Oil of Juniper* ℥j. in *Rect. Spirit* ℥xlix. 1 in 50, ⅕ as much as B. 1864, but 19 times as much Oil of Juniper as Sp. Juniperis Comp., L. P.

Action. Uses.—Stimulant adjunct in doses of ♏xxx.-ʒj. to Diuretic draughts.

SABINÆ CACUMINA, B. Juniperus Sabina, *Linn.* The fresh and dried tops. (Collected in spring, from plants cultivated in Britain.) Savin.

Savin is the βραθυς of Dioscorides, converted by the Arabs into *buratee.*

A small, bushy, very compact shrub, disposed to spread. Branches slender, completely invested by the short, imbricating leaves. Leaves small, ovate, convex, opposite, decussate, deeply imbricated. Fruit round, of a bluish purple, about the size of a currant.—A native of the midland parts of Europe, of the mountains of the south of Europe, and of Russia in Asia.—Nees von E. 87.

The whole plant exhales a strong fœtid odour, and has an acrid, bitter, and disagreeable taste. The officinal parts are the young branches, which are completely enveloped in the small imbricated leaves, and, when dry, retain a portion only of the properties of the fresh plant. These are taken up by Spirit, fixed oils, and fats,—partially by water. They depend on the presence of a Volatile Oil, Resin, Gallic acid, &c. A deep-green colour is formed on the addition of a Sesqui-salt of Iron to its watery infusion.

Action. Uses.—Irritant, in large doses poisonous. Sometimes used to destroy warts, and its ointment to keep open issues. In small doses, Stimulant, Diuretic, and Emmenagogue. Often taken to cause abortion: it can only do so by producing inflammation, and thus may destroy the mother, sometimes without causing the expulsion of the child. Dr Pereira recommends it as an Emmenagogue, in the form of an infusion in 64 parts of water, in doses of f ʒiv.–f ℥j., or the Volatile oil in some mucilaginous vehicle.

In cases of poisoning, the green matter suspected to be Savin should be pounded into a pulp, moistened with some strong acid, and then examined by the microscope, when the woody cells will exhibit the characteristic circular pores found in all the Coniferæ.

OLEUM SABINÆ, B. Oil of Savin.

Obtained in the proportion of about 3 per cent., by distilling with water the fresh tops of the plant; is light in colour; in composition resembles Oils of Juniper and of Turpentine; and has the strong odour and the disagreeable acrid taste of the plant.

"Distilled in England from fresh Savin. Colourless or pale yellow." (B.)

Action. Uses.—Acrid Stimulant. Emmenagogue in doses of ♏ ij.–♏ v. with Sugar, gr. x.–gr. xx., or with some mucilaginous substance.

TINCTURA SABINÆ, B. Tincture of Savin.

Prep. B.—Take of *Savin Tops*, dried and coarsely powdered, ℥ijß; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Dose.—♏ xx.–♏ xl.

UNGUENTUM SABINÆ, B. Savin Ointment.

Prep.—B. Take of *fresh Savin tops*, bruised, ℥viij.; *Yellow Wax*, ℥iij.; *Prepared Lard*, ℥xvj. Melt the Lard and the Wax together on a water bath, add the Savin, and digest for twenty minutes. Then remove the mixture, and express through calico.

Action. Uses.—Acrid application to keep open blistered surfaces, and the discharge from setons. But much of the oil is dissipated. When made in a porcelain vessel on a water bath, it is of a yellowish-green colour, efficient, and active, and will keep good for a long time. It ought not to be made in a copper vessel. (P. J.)

CLASS II. MONOCOTYLEDONES *vel* ENDOGENÆ.

PALMÆ, *Juss.* Palms.

Palms by Linnæus were styled the Princes of the vegetable kingdom. It has been said that Flour, Sugar, Oil, Wax, and Wine are all yielded by the family of Palms, as well as thread, utensils, timber for habitations, and leaves for thatching.—They inhabit chiefly the tropical parts of the world, though a few extend to higher latitudes.

Phœnix dactylifera is the Date Tree, affording Dates, which are the chief article of diet to thousands of Arabs and Africans, and are imported here as an article for the dessert.

Phœnix sylvestris in India, with *Arenga saccharifera* and *Nissa fruticans* in Indo-China, yield large quantities of Sugar by the simple evaporation of their sap.

Cocos nucifera, the Cocoa-nut Palm, one of the most useful of trees, is valuable on account of the kernel of its fruit (mentioned by Avicenna as the Indian Nut), which is not only edible, but yields large quantities of Oil.

Elæis guineensis and *E. melanococca* yield the immense quantities of Palm oil which are imported from the West Coast of Africa. The Oil is obtained by bruising the fleshy part of the fruit. It has a solid consistence, is of an orange-yellow colour, and rather a grateful odour. It consists of about 30 parts of a peculiar solid fat, *Palmitine*, and 70 of *Elaine*, besides the principles which give it odour and colour. It is emollient, and sometimes used as an embrocation to spasms and bruises; but its chief employment is for making Soap. The E. C. in their last Pharmacopœia erroneously indicated the *Cocos butyracea*, a South American Palm, as the source of Palm oil.

ARECA CATECHU, *Linn.* The Catechu or Betle Nut Palm, *foful* of the Arabs, receives its specific name from a kind of Catechu being made from its seeds, which, being boiled down, yield an astringent Extract, from the large quantity of Tannin which they contain. On this account the tree has been mentioned as one of the sources of Catechu; but it does not seem probable that any of this Catechu reaches Europe, for Catechu is one of the regular imports into the ports of the Madras Presidency. The seeds or nuts are, however, always in demand, and are an extensive article of commerce, because they form one of the ingredients of the celebrated masticatory of the East, called Pan or Betle (*see* p. 631). They are sometimes sold cut into transverse slices.

Calamus Draco, Willd., is one of the species which yields the reddish resinous substance known as Dragon's-blood (the *dum-al-akhwain* of the Arabs). It is only used for colouring.

Ceroxylon (now *Iriartea*) *andicola* yields wax, as does another Palm, called *Carnauba* in Brazil.

SAGO. Starch from the stem of Palm trees.

Sagus lævis, Rumph., is mentioned in the L. P. as yielding Sago, which is described as *Caudicis fæcula.* Other species of Palms are also alluded to. In the E. and D. P. it is said to be the Farina from the interior of the trunk of various Palms and species of Cycas.

The Malays are said to prefer the Sago of *S. Rumphii.* Dr Roxburgh states that the granulated Sago is made from *Sagus* (*inermis*, Roxb.) *lævis*, Jack. Blume states it to be produced by *Sagus lævis* and *S. genuina.* The *Saguerus saccharifer* also (called likewise *S. Rumphii*, and *Arenga saccharifera*), when exhausted of its saccharine sap, yields Sago of good quality. *Caryota urens* and *Phœnix farinifera* also yield a Sago-like farina in India. It is, therefore, difficult to select one as the sole officinal species. Sago is also said to be produced by species of Cycas (*C. circinalis*, D. P.); but the statement has never been properly confirmed. Some *Zamias* are said to yield one kind of Arrowroot in the West Indies.

Sago is produced chiefly in the Moluccas and in Sumatra; but it is first imported into Singapore, in very large quantities, for granulation and re-exportation. It is first obtained by cutting and splitting the stem, washing and stirring it up with water, when the fecula becomes suspended, and is passed through a sieve. The fecula then subsides, and forms a powder like Arrow-root, but of a dirty-white colour, or *Meal Sago*, of which 500 or 600 ℔ may be yielded by a single tree. This, when imported into Singapore, is first well washed, partially dried, then passed through a sieve, and then again slowly along a cloth bag, which is kept in a state of vibratory agitation, during which it granulates. It is again sifted, and then roasted for a few minutes in iron pans which have been slightly rubbed with earth oil. After another sifting, the Sago is subjected to a final roasting. Common Sago was formerly of the size of Coriander Seeds, but unequal, and of a reddish or brownish-white colour, and mixed with some of the meal. It is formed of the Starch-globules of the meal aggregated together, but unbroken. The Chinese settled at Singapore, some time since, introduced their methods of refining and producing it in much smaller grains. This kind is now called Pearl Sago, and is in small grains about the size of a pin's head, hard, whitish, with a pearly lustre, sometimes even translucent, without odour, and with very little taste. It is sometimes bleached, and having been subjected to heat, the Starch globules are ruptured, so that even in cold water Iodine produces a blue colour with this Sago. Some fine Sago has been sent from Moulmein in Burmah.

M. Planche has arranged the Sagos of commerce under six different heads, according to the places whence they are procured, M. Guibourt arranges them all under three heads—1. Uncut Sago. 2. Seed Sago. 3. Tapioca Sago, which is the same as Pearl Sago. The unbroken microscopic grains of Sago are more or less of an ovoid form, but most appear as if truncated or mullar-shaped. An imitation of Sago is made with Potato starch near Paris. (See *Amylum.*)

Sago is insoluble in cold water, but by long boiling becomes soft and then transparent, and ultimately forms a gelatinous solution, which in all essentials corresponds with one of Starch.

Action. Uses.—Sago is Nutrient and Demulcent, and well suited for invalids. May be boiled with water, with milk, or in Soups.

LILIACEÆ, *Dec.* Lilyworts.

The Liliaceæ as at present constituted include several groups, which are often treated of as distinct families, as *Tulipeæ*, including *Lilium candidum*, at one time officinal, chiefly as a demulcent; *Hemerocallideæ: Asphodeleæ* including Allium. Scilla, *Aloineæ*, the Aloe plants; *Asparageæ*, and others (*see* Lindl. Veg. King. p. 200.)—The true Lilies are allied to Palms, also to *Melanthaceæ*, and to *Amaryllideæ*. They are widely diffused, but are chiefly found in temperate climates.

ALLIUM. Allium sativum, *Linn.* Bulb of the Common Garlic.

Garlic is the σκόροδον of the Greeks, *Som* of the Arabs, and *Shumin* of Numbers xi. 12. It has been used as an article of diet, and likewise in medicine, from very early times.

In the L. P. of 1836 the bulb of the Leek, *A. Porrum*, was officinal; and in the last edition but one of the D. P., that of *A. Cepa*, the common Onion. Both have since been expunged, and the Garlic was retained only in the E. P.

The Garlic, Onion, and Leek are well known as articles of diet, or rather as condiments. Their properties are very similar. The Garlic, when applied externally, will act as a Rubefacient; taken internally, it acts as a Stimulant, and as an Expectorant and Diuretic, producing at the same time a disagreeable odour in the breath. It is sometimes employed as an Anthelmintic in Ascarides.

SCILLA, B. Urginea Scilla, *Steinheil.* (*Scilla maritima*, Linn.) The Bulb, sliced and dried. (From the Mediterranean coasts.) Squill.

The Squill (Σκίλλα) was employed by the ancient Greeks. The Asiatics substitute for it an allied species, *Urginea indica*, to which they apply the name of *iskeel*. From the difference in character of the officinal plant from the ordinary species of Scilla, M. Steinheil formed it into the genus Urginea. The name *Squilla* has also been applied to the same genus.

Bulb roundish-ovate, very large, half above ground; integuments greenish or reddish. Leaves all radicle, appearing after the flowers, spreading, large, rather fleshy, broad, lanceolate, channelled, recurved. Scape from 2 to 4 feet high, rising from the centre of the leaves, simple, cylindrical, terminated by a long, dense, ovate raceme of flowers, with long bracts. Flowers of a pale yellowish-green colour. Sepals 3, coloured, spreading. Petals very like them, and scarcely broader. Stamens 6, shorter than the perianth; filaments smooth, somewhat dilated at the base, acuminate, entire; anthers yellow. Ovary 3-parted, with 3 nectariferous glands at the apex. Style smooth, simple. Stigma obscurely 3-lobed, papillose. Capsule rounded, 3-cornered, 3-celled. Seeds numerous, in 2 rows, flattened, winged, with a membranous testa, (*Lindley.*) Native of both the north and the south sides of the Mediteranean and of the Levant. Flowers about August.—B. M. t. 918; Nees von E. 55; St. and Ch. 153.

The Squill bulb is formed of scales applied over each other, of which the external ones are dry, membranous, and often coloured; the inner colourless, thicker, and full of acrid viscid juice. It is sometimes imported in its entire state, packed in sand; the average weight is from half a pound to four, but it is occasionally ten pounds in weight, and as large as a child's head. In this state it is very retentive of moisture and of life, and may be preserved in dry sand. Before drying, the dry outer coats are to be removed, and the others cut into transverse narrow strips, and dried with moderate heat. Squill is usually imported in this latter state, the pieces being white or yellowish-white, often contorted, translucent, of a mucilaginous and bitter taste, at first rather tough, but when quite dry, brittle enough to be powdered. If exposed to moist air, they become again soft and flexible. Many spiral vessels may be detected in these scales, by the microscope, as well as numerous acicular raphides. *Pulvis Scillæ* contains 9 or 10 per cent. of these crystals. This powder is apt to concrete and become resinous on keeping, apparently from a decomposition of some of its principles. Analysed, fresh Squill consists of water (about ⅘ths) with Gum, uncrystallisable Sugar, traces of Tannin, Phosphate of Lime, Lignin, and a bitter resinous Extractive, from which a peculiar principle called *Scillitine* has been extracted. Observers differ as to the nature of this principle. Probably more than one body has been included under this name; for some have found it to be uncrystallisable, neutral in reaction, and resinous in appearance; others have obtained crystals, which are said to be capable of neutralising acids. Labourdais states that with strong Sulph. acid it assumes a fine purple tint, which gradually vanishes. Squill contains, also, in its extractive, a peculiar resinous *acrid principle*, to which perhaps its properties are mainly owing. They may be extracted by Alcohol, Spirits, and Vinegar.

Action. Uses.—An irritant Poison. In small doses, Expectorant, Diuretic; and in larger, Emetic and Cathartic. Used as an Expectorant in chronic Catarrh; as a Diuretic in general Dropsy, especially when there is a deficiency of tone. Its effects may be increased by combination with other Diuretics and Expectorants. The powder may be given in doses of gr. j.–gr. iij. As emetic, in gr. x.–gr. xv.

ACETUM SCILLÆ, B. Vinegar of Squill.

Prep.—Take of *Squill* bruised, ℥ijß; *diluted Acetic acid*, Oj.; *Proof Spirit*, f℥jß. Macerate the Squill in the Acetic acid for seven days, then strain with expression, add the Spirit to the strained liquor, and filter.

Restored in 1867 from L. P. Useful in Cough mixtures, and employed to make the following.

Dose.—♏xv.–♏xl.

OXYMEL SCILLÆ, B. Oxymel of Squills.

Prep.—Take of *Vinegar of Squill*, Oj.; *Clarified Honey*, ℔ij. Mix and evaporate by a water bath until the product, when cold, shall have a specific gravity 1·32.

Restored from L. P. An admirable Expectorant in chronic Coughs, &c.

Dose.—fʒß–fʒj.

Pilula Ipecacuanhæ cum Scilla, B. (*See* p. 486.)

Pilula Scillæ Composita, B. Compound Squill Pill.

Prep.—B. Take of *Squill* in powder, ℥j¼; *Ginger* in powder, ℥j.; *Ammoniac* in powder, ℥j.; *Hard Soap*, ℥j.; *Treacle* by weight ℥ij., or a sufficiency. Mix powders, add Treacle, beat into a uniform mass.

Action. Uses.—Expectorant in doses of gr. v.–gr. xx.

Syrupus Scillæ, B. Syrup of Squill.

Prep.—B. Dissolve *Refined Sugar* ℔ijß in *Vinegar of Squill* Oj., with the aid of heat.

Action. Uses.—Expectorant in doses of fʒß–fʒj. May be used as an Emetic for children in doses of fʒj.

Tinctura Scillæ, B. Tincture of Squill.

Prep.—B. *Squill* bruised, ℥ijß; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Expectorant and Diuretic in doses of ♏x.–fʒß.

Aloe, *Linn.* Aloe.

Succulent plants, with spiked inflorescence. Perianth tubular, 6-cleft, sometimes so deeply divided as to appear 6-petaled, converging below into a tube, with the limb regular, spreading, or recurved, somewhat fleshy, nectariferous at the base; segments ligulate, the interior equal to or larger than the exterior, and imbricate. Stamens hypogynous, ascending as long as the tube, or projecting beyond it. Style as long or almost wanting, 3-furrowed. Stigma simple or triple, minute, and replicate. Capsule membranous, scarious, obtusely or acutely triangular, 3-celled, 3-valved; valves bearing the septa in the middle. Seeds numerous, in two rows, roundish, flattened, or three-cornered, winged or angled.

Aloe Barbadensis, B. Barbadoes Aloes. Aloe vulgaris, *Lam.* The juice of the leaf, inspissated. (Imported from Barbadoes.)

Aloe Socotrina, B. Socotrine Aloes. One or more undetermined species of Aloe. The juice of the leaf, inspissated. (Produced chiefly in Socotra.)

[Aloe Hepatica, L. (*Indica.*) Hepatic Aloes. Undetermined species of Aloes. Folii Succus spissatus? L.]

The word Aloe, in our translation of the Bible, is confounded with *ahila*, or Eagle-wood. (*See* Ahalim, *Bibl. Cycl.*) Aloes were known to Dioscorides, to Galen, and to Celsus. The Arabs describe three kinds, Socotrine, Arabic, and Semegenic. The Indo-Persian writers give *Sibr* or *Sibbur*, as its Arabic, and *bol-seah* (black Myrrh) as its Persian name. The Hindoo *elwa* is very similar to the word *Aloe*, and the Greek *fekra*, which the Arabs quote, seems to be derived from πικρος.

Aloes is the bitter proper juice inspissated of several species of Aloe. It is contained in the vessels lying under the epidermis of their fleshy leaves, the interior being filled with much watery colourless sap. In many cases the leaves are cut into pieces and boiled with water, so as to form an extract rather than an inspissated juice; but both kinds are sold under the same name. That of commerce being derived from a variety of sources, is necessarily produced by different species. The Asiatic species, with those of Abyssinia and Socotra, are enumerated in Dr Royle's *Illustr. of Himal. Bot.* p. 389. The following may be referred to until more accurate information is available respecting the African and Arabian species :—

(A. VULGARIS, *Lam.*) A. BARBADENSIS, *Mill.* Stem somewhat shrubby, offshoots from the root. Leaves sword-shaped, sinuato-serrate. Corol yellow. Var. of *A. vulgaris*, Nees von E. 50.—South of Europe, perhaps in the Peninsula of India. (Rheede, ii. t. 3.) Introduced into the West Indies.

A. ABYSSINICA, *Lam.* Subcaulescent. Leaves long and lanceolate, rather erect, hard, of a deep-green colour, rather concave above; margin sinuato-dentate, reddish, flowers of a greenish yellow. Var. of *A. vulgaris*, Linn.—Abyssinia.

A. SOCOTRINA, *Lam.* Stem shrubby, thick, dichotomous. Leaves ensiform, greenish, incurved towards the apex, with the marginal serratures small, white, and numerous. Flowers scarlet at the base, pale in the middle, green at the point.—Nees von E. 50; St. and Ch. 110.

ALOE RUBESCENS, *Dec.* Stem suffruticose. Leaves amplexicaul. spreading, thorny at the margin. Peduncle compressed, branched. Branches sub-bracteate. —*Pl. grass.* t. 15. A native of Arabia.

A. ARABICA, *Lam.* *A. variegata*, Forsk, with spotted leaves.

A. SPICATA, *Thunb.* Caulescent. Leaves flat, ensiform, dentate. Flowers spiked, campanulate, horizontal.—Interior of the Cape of Good Hope; probably yields some Cape Aloes.

"Ex hujus succo optima gommi resina aloes paratur: ex reliquis speciebus vilior." *Linn. fil.* But many other species grow in South Africa.

Dr Christison remarks it as probable that *A. linguæformis* of Thunberg, and *A. commelini* of Willdenow likewise yield some Aloes.

ALOE INDICA, *Royle.* A low plant, with spikes of red flowers, which grows in dry barren places in N. W. India. This, if known to Roxburgh, was probably included by him in *A. perfoliata.* Col. Sykes has a species from the Deccan, also with red flowers.

The Aloes in common use are the Barbadoes, Socotrine, Hepatic, and Cape Aloes.

Barbadoes Aloes is prepared in the West Indies, chiefly from the variety of *A. vulgaris*, but also probably from *A. socotrina* and *A. purpurascens*, which are said to be cultivated there. Browne, in his *Nat. Hist. of Jamaica*, states that the largest and most succulent leaves are placed upright in tubs, that the juice may dribble out. This, evaporated, forms a kind of Aloes which is sold as Socotrine; but the common Aloes is obtained by expressing the juice out of the leaves, boiling it with water, evaporating and pouring into gourds, whence this kind is often called Gourd Aloes. "In yellowish-brown or dark-brown opaque masses; breaks with a dull conchoidal fracture ; has a bitter nauseous taste, and a strong disagreeable odour ; dissolves almost entirely in proof Spirit, and during solution exhibits under the microscope numerous crystals. Usually imported in gourds." (B.) It sells for a high price, is much in demand for veterinary medicine, and may be distinguished by its dark-brown or blackish, sometimes liver-brown colour ; by its usually dull appearance, and its disagreeable odour, especially when breathed upon. Being more gummy, it is tougher, and difficult to pulverise. It is said to be the most energetic, as a medicine, of all the kinds of Aloes.

Socotrine Aloes is distinguished by being of a redder colour when compared with the other kinds. The best is garnet-red, in thin and translucent pieces. It is described in the B. P. as "in reddish-brown masses, opaque, or translucent at the edges ; breaks with an irregular or smooth and resinous fracture : has a bitter taste, and a strong but fragrant odour ; dissolves entirely in proof Spirit, and during solution exhibits under the microscope numerous minute crystals." (This description will apply to the better kinds of Hepatic Aloes.) When quite dry, it is of a golden-red, but by exposure the colour is changed, and this Aloes becomes of a brownish-red. The fracture is conchoidal, usually smooth and shining, but sometimes a little rough. The odour is rather fragrant, especially when the Aloes is fresh and heated. It is easily reduced to a golden yellow powder, and is nearly all soluble in Spirit of the Sp. G. 0·950. There can be no doubt that some of this Aloes is produced in the island of Socotra, as Lieutenant Wellsted describes the plants as growing in parched and barren places at 500 to 3000 feet above the sea, and the leaves as being plucked and the juice allowed to exude into a skin. Specimens were procured for Dr Royle by a medical friend at Socotra, but unfortunately after his ship had been supplied, when two adulterated skins (those mentioned by Dr Pereira) were supplied as genuine Socotrine Aloes. About two tons are exported annually from Socotra. Some used to be carried up the Red Sea, and thence into the Mediterranean. Ainslie states that a large quantity of Socotrine Aloes is prepared in the kingdom of Melinda, on the east coast of Africa ; and some is said to be imported directly from Zanzibar. The semi-fluid pieces are dried in thin layers, and the inferior portions are strained in this country.

Hepatic Aloes, so called from its usual liver-brown colour, is often referred to as *Aloe indica,* but is certainly not produced in India. This is evident from the specimens, all inferior in quality, in Dr Royle's collection, and those procured at his request by the late Dr Malcolmson. The Hepatic, therefore, is the Aloes imported into Bombay from Arabia and Africa, and which is known in India by the name of Bombay Aloes. Some of it, if not all, is probably obtained from the same sources as the Socotrine, which it resembles in odour : and, as Dr Pereira states, " the two are sometimes brought over intermixed, the Socotrine occasionally forming a vein in a cask of the Hepatic Aloes." It is of a liver-brown colour, has a dull, somewhat waxy fracture, and is less fragrant. The taste is nauseous and intensely bitter; the powder of a golden-yellow colour. This kind is inferior in quality to the fine Socotrine. The sources of these two kinds of Aloes are not known with certainty. *Aloe socotrina* and *A. purpurascens* probably furnish at least a part. The juice is allowed to exude from the leaves, which are sliced transversely, or gently pressed with the hand. Hepatic Aloes is not mentioned separately in the B. P., but may be regarded as an inferior kind of Socotrine.

Cape Aloes, procured, no doubt, from a variety of species of Aloe, is especially distinguished by its vitreous lustre, and is hence called *Aloe lucida* by some authors. The finer qualities are of a deep-brown colour externally, with a tinge of olive-green; thin laminæ are translucent, with something of a yellowish-red colour. It is very brittle, easily pulverised, its odour strong, rather disagreeable, and its powder of a yellow colour. Some of the inferior kinds are black in colour, vesicular, and with a rough fracture. Some Cape Aloes is yielded by *A. spicata*. Dr Pappe, in his Cape Medical Flora, mentions several other species as yielding Aloes in different parts of the colony. He states that *A. ferox*, Lam., a native of Swellendam, yields the best. Some from *A. africana*, Mill, is exported in large quantities from the eastern districts. But the Aloes commonly used at the Cape is that of *A. plicatilis*, Mill, which inhabits a mountain range near the Paarl.

Some inferior kinds of Aloes are produced in *India*. A kind called Mocha Aloes may come from *Arabia*. For Landerer states that much of the drug employed in the East is obtained from Arabia, where many species grow abundantly. Excellent Aloes is said to be produced in *Cyprus*, but not in sufficient quantity to be exported. And lastly, a small quantity is yielded in the island of *Curaçoa*, in the Dutch West Indies.

Liquid Aloes has lately been imported from the coasts of the Red Sea. It yields a crystalline deposit on standing, and may be dried into a mass resembling the opaque Socotrine kind.

All the kinds of Aloes have an extremely disagreeable taste, which is very permanent in the fauces. The odour is peculiar, and is more perceptible when the Aloes is breathed upon. A great portion of Aloes is dissolved by cold water; and much of what first appears insoluble is dissolved by boiling water, but again deposited on cooling.

Aloes has not yet been accurately analysed. It contains some *vegetable albumen* (a trace in the transparent, more in the opaque kinds); and an acid, called *Aloesic*, which resembles Gallic acid, but produces an olive-brown colour with a persalt of Iron. But it also contains *Resin* (about 30 per cent.), and a peculiar principle, called *Aloine*,—to either or both of which its purgative and tonic properties must be owing.

Aloine was first discovered by Meissner, and was obtained by the Messrs Smith from Barbadoes Aloes in 1851. It may be made by drying this Aloes, pounding it with sand to prevent it from agglutinating, macerating it then repeatedly in cold water, and evaporating the solutions *in vacuo* to a syrup. After standing for some time, small granular crystals are deposited, which are to be purified by several crystallisations out of hot water. Aloine is neutral, and has a very bitter taste. It requires for solution nearly 500 parts of cold water, and is also insoluble in cold alcohol, but it is readily dissolved by both when they are slightly warmed. If its solution be heated to 212°, it is rapidly oxidised and decomposed. It is soluble in alkaline fluids, forming a yellow solution, which gradually becomes darker. Digested for some time in strong Nitric acid, Aloine is converted into *Chrysammic acid.* This acid produces with Liquor Potassæ a deep-red solution.

In many of its chemical characters, in its bitter taste, and perhaps also in its tonic properties, *Aloine* is analogous to *Rheine*, the peculiar principle of Rhubarb. Like it, it appears to become oxidised into a resinous substance, which possesses purgative properties. Analysed by Dr Stenhouse, Aloine gave the formula $C_{34}H_{18}O_{14} + HO$. (P. J. xi. 458.)

Action. Uses.—Aloes, in small doses, is Tonic; in larger, Cathartic. It is considered by some to stimulate the liver, and also to supply the place of the deficient bile in torpidity of the intestinal canal. Its action seems directed to the larger intestines, especially the rectum, and thus to be useful in evacuating them, but detrimental when there is already irritation or Hæmorrhoids. By this action it no doubt stimulates neighbouring organs, and becomes thus useful as an Emmenagogue.

EXTRACTUM ALOES BARBADENSIS, B. Extract of Barbadoes Aloes.

Prep.—B. Take of *Barbadoes Aloes*, in small fragments, ℔j.; *boiling Distilled water*, Cj. Add the Aloes to the Water, and stir well until they are thoroughly mixed. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed liquors by a water bath or a current of warm air to dryness.

EXTRACTUM ALOES SOCOTRINÆ, B. Extract of Socotrine Aloes.

Prep.—The same, with *Socotrine Aloes.*

By this treatment the mechanical impurities, and perhaps also the resin, are separated from the Aloes, and the product is supposed to be less irritant than the crude drug.

Action. Uses.—Cathartic, in doses of gr. v.–gr. xv.

[PULVIS ALOES COMPOSITUS, L. Compound Aloes Powder.

Prep.—Rub separately into powder *Aloes, Socotrine* or *Hepatic*, ℥jß; *Guaiacum*, ℥j., and add *Comp. Cinnamon powder*, ℥ß. Mix.

Action. Uses.—Warm Cathartic and Diaphoretic in doses of gr. x.–gr. xx.]

PILULA ALOES BARBADENSIS, B. Pill of Barbadoes Aloes.

Prep.—B. Take of *Barbadoes Aloes*, in powder, ℥ij.; *Hard Soap*, in powder, ℥j.; *Oil of Caraway*, f ʒj.; *Confection of Roses*, ℥j. Beat all together, until thoroughly mixed.

(It resembles the Pil. Aloes cum Sapone of the L. P.)

PILULA ALOES SOCOTRINÆ, B. Pill of Socotrine Aloes.

Prep.—B. Take of *Socotrine Aloes*, in powder, ℥ij.; *Hard Soap*, in powder, ℥j.; *Volatile Oil of Nutmeg*, f ʒj.; *Confection of Roses*, ℥j. Beat all together until thoroughly mixed.

(The Pil. Aloes Comp. of the L. P. was made with Socotrine Aloes, but contained also one-third part of Extract of Gentian.)

Action. Uses.—Both Cathartic and Tonic, in doses of gr. v.–gr. x. The Soap is thought to promote the action of Aloes.

PILULA ALOES ET FERRI, B. Pill of Aloes and Iron.

Prep.—Take of *Sulphate of Iron*, ℥jß; *Barbadoes Aloes*, in powder, ℥ij.; *Compound Powder of Cinnamon*, ℥iij.; *Confection of Roses*, ℥iv. Reduce the Sulphate of Iron to powder, rub it with the Aloes and compound Powder of Cinnamon, and adding the Confection, make the whole into a uniform mass.

From the E. P. A useful combination in Anæmia with Amenorrhœa.

Dose.—Gr. v.–gr. x.

PILULA ALOES ET MYRRHÆ, B. Pill of Aloes and Myrrh.

Prep.—B. Take of *Socotrine Aloes*, ℥ij.; *Myrrh*, ℥j.; *Saffron*, dried, ℥ß; *Confection of Roses*, ℥ijß. Triturate the Aloes, Myrrh, and Saffron together, and sift; then add the Confection of Roses, and beat together into a uniform mass.

(It resembles the preparation of the L. P.)

Action. Uses.—Cathartic and Emmenagogue in doses of gr. v.–gr. x. every night.

PILULA ALOES ET ASSAFŒTIDÆ, B. Pill of Aloes and Assafœtida.

Prep.—B. Take of *Socotrine Aloes*, in powder, ℥j.; *Assafœtida*, ℥j.; *Hard Soap*, in powder, ℥j.; *Confection of Roses*, ℥j. Beat all together, until thoroughly mixed.

Action. Uses.—Cathartic and Antispasmodic, in doses of gr. v.–gr. x. thrice a-day.

DECOCTUM ALOES COMPOSITUM, B. Compound Decoction of Aloes.

Prep.—B. Take of *Extract of Socotrine Aloes*, gr. cxx.; *Myrrh*, bruised, gr. xc.; *Saffron*, chopped fine, gr. xc.; *Carbonate of Potash*, gr. lx.; *Extract of Liquorice*, ℥j.; *Compound Tincture of Cardamoms*, f℥viij.; *Distilled water*, a sufficiency. Reduce the Extract of Aloes and Myrrh to coarse powder, and put them, together with the Carbonate of Potash and Extract of Liquorice, into a suitable covered vessel with a pint of Distilled water; boil gently for five minutes, then add the Saffron. Let the vessel with its contents cool, then add the Tincture of Cardamoms, and covering the vessel closely, allow the ingredients to macerate for two hours; finally, strain through flannel, pouring as much Distilled water over the contents of the strainer as will make the strained product measure f℥xxx. (4 gr. of Extract of Aloes in the ℥, to 5·6 gr. in B. P., 1864, and 3·3 in L. P.)

Action. Uses.—Cathartic, Emmenagogue, in doses of f℥ß–f℥ij. The boiling must not be carried to any extent, as some of the Aloes will then become insoluble.

VINUM ALOES, B. Wine of Aloes.

Prep.—B. Take of *Socotrine Aloes*, ℥jß; *Cardamoms*, ground, gr. lxxx. *Ginger*, in coarse powder, gr. lxxx.; *Sherry*, Oij. Macerate for seven days in a closed vessel, with occasional agitation, and add *Sherry* to make Oij.

Action. Uses.—Warm Cathartic, in doses of ʒj.–ʒij.

TINCTURA ALOES, B. Tincture of Aloes.

Prep.—B. Take of *Socotrine Aloes*, in coarse powder, ℥ß; *Extract of Liquorice*, ℥jß; *Proof Spirit*, a sufficiency. Macerate the Aloes and Extract of Liquorice in f℥xv. of the Spirit for seven days, in a closed vessel, with occasional agitation, then filter, and add sufficient Proof Spirit to make Oj.

Action. Uses.—Cathartic adjunct to Purgative or Emmenagogue draughts, in doses of fʒß–fʒij. The weak Spirit is an excellent solvent of the active properties.

[TINCTURA ALOES COMPOSITA, L. Tinct. Aloes et Myrrhæ.

Prep.—Macerate for seven days coarsely powdered *Socotrine* or *Hepatic Aloes* ℥iv., *Saffron* ℥ij., in *Tincture of Myrrh* Oij. Strain. Not well prepared by percolation.

Action. Uses.—Emmenagogue. Stimulant Cathartic, and adjunct to draughts and mixtures, in doses of fʒß–fʒij.]

ENEMA ALOES, B. Enema of Aloes.

Prep.—Mix and rub together *Aloes* gr. xl., *Carb. Potash* gr. xv., and *Mucilage of Starch*, Oß.

Used to dislodge Ascarides from the rectum, and in Amenorrhœa.

Aloes is an ingredient of the Pil. Cambogiæ Comp., Ext. Colocynthidis Comp., Pil. Coloc. Comp., Pil. Colocynthidis et Hyoscyami, Tinct. Benzoini Comp., Pil. Rhei Comp.

MELANTHACEÆ. *R. Brown.* (*Colchicaceæ.*)

The Melanthaceæ are allied to Junceæ and to Liliaceæ, are found in temperate parts of the world, and are remarkable for secreting Veratria.

COLCHICI CORMUS ET SEMINA, B. Corm and ripe seeds of Colchicum autumnale, *Linn.* Colchicum, or Meadow Saffron.

Colchicum is well described by Dioscorides. It was used by the Arabs, and is their *sorinjan;* they give *kuljikoon* as its Greek name. The Hermodactyls (Sweet and Bitter *sorinian* of the Arabs) of the later Greeks and Arabs were no doubt species of this genus. Dale, Miller, Guibourt, and lastly Planchon, all of whom, as well as others, have directed attention to this subject, have fixed especially upon *Colchicum variegatum*, Linn. Dr Royle's specimens have been described by Dr Pereira. Colchicum is indigenous in England.

The true root is fibrous, and below the underground stem or cormus (the bulbo-tuber of some authors), which is ovate, about the size of a chestnut, solid, fleshy, enveloped in a brown-coloured tegument. It is rather convex on one side, flattened on the other, or with a longitudinal furrow made by the growing plant. It is largest and in full perfection in June, or early in July, when a new but minute corm is seen at its lower end close to the radicles. This new corm flowers in autumn, is then small, but enlarges before spring, when the young seed-vessel rises with the leaves, having remained underground from the time of flowering in autumn. The seeds ripen about midsummer. The parent corm becomes more spongy and watery as the new flower rises, but retains its size and form till next April, the second spring of its own existence. But by the end of May it has become shrivelled and leathery, and is attached to the lower part of its progeny, now the perfect and full-sized corm. In Scotland, where the seeds do not ripen, the plant propagates itself by little corms being thrown off from the large corm during the second or last spring of its existence. The leaves are broadly lanceolate, flat, somewhat keeled, about a foot in length, dark green, smooth, and appearing in the spring with the capsules. Flowers several, leafless, rising from the corm with a long white tube; limb of a pale purple or rose colour. Perianth funnel-shaped, with a very long tube; limb 6-parted, petaloid. Stamens 6, inserted into the throat of the perianth. Capsules 3, connected throughout, 1-celled (fig. 1 and 4), opening at the inner edge (2), many-seeded. Seeds (fig. 5) roundish, with a brown shrivelled skin, and large strophiole, which gives them a rough appearance.—Native of moist meadows throughout Europe.—Nees von E. 49; St. and Ch. 70.

Dr Christison has given the fullest and best account of the growth of the corms of the Colchicum, which has above been very much abridged. Its activity is considered to be greatest in July and August, that is, when the leaves have withered, and the flowers of he new corm have not appeared. Thus the B. P. directs that the orm be collected about the end of June, or before the autumnal ud has developed. Dr Lindley says he has seen many *cwt.* sent to own of those which had flowered; and the flowers broken off, so as o prevent the circumstance from being observed. Dr C. observes, hat the corm is whitest, firmest, and largest at the end of June and

Fig. 97.

beginning of July; that it then abounds in Starch, and there is no other corm connected with it. But if taken up in April, two are found united, one spongy, the other plump and firm. Though they are generally collected when the corm is single, large, and plump, Dr C. doubts whether this is essential, as the corm in April, though more watery, is at least as bitter; and he quotes Stolze as showing that in autumn the corm contains of water 80 per cent., Starch 10, Bitter Extract 2, and Sugar 4, with a little Gum, Resin, and Lignin; but in April the proportion of Bitter Extract is greater. Colchicum Root is used fresh and dry. To be preserved it is stripped of its coats, then cut into thin transverse slices, and dried, first with a gentle heat, slowly increased to a temperature of 150°. The slices should be dry, firm in texture, and of a greyish-white colour, and should readily change their colour to blue when moistened with vinegar and touched with Tincture of Guaiacum, as pointed out by Dr A. T. Thomson. (This colour is produced by Gluten.) The taste is disagreeable, bitter, and somewhat acrid. The seeds have the same properties, and, if collected ripe, are necessarily more uniform. They are "about the size of black mustard seed, very hard, reddish-brown."

According to Pelletier and Caventou, the corm contains an alkali (supposed by them to be Veratria), united with an excess of Gallic acid, Fatty matter united with a volatile acid, Yellow Colouring matter, Gum, Starch, Inulin in abundance, and Lignin. But Geiger and Hesse announced the presence of a peculiar alkali, *Colchicina.* This very much resembles Veratria; but differs from it in being soluble in water, and crystallisable. The powder does not excite sneezing, like that of Veratria. Colchicina turns to a yellow-brown with strong Sulph. acid; with Nit. acid it exhibits a play of colours, commencing in violet. It is a powerful poison. The active principles of Colchicum are partially taken up by water; but readily by Alcohol, diluted Spirit, and Vinegar, which are used as the officinal solvents.

Action. Uses.—Colchicum is Irritant, and in large doses a Narcotico-Acrid Poison. In small doses repeated, it stimulates some of the secretions, and acts as a Nauseant and Cathartic, Diuretic, and Diaphoretic, producing at the same time Sedative and Anodyne effects; thus relieving the pain of Gout and Rheumatism, and controlling the action of the heart in Inflammatory diseases. In acute attacks of Gout it is almost specific. It is doubtful whether its full effect as a medicine is experienced until some of the inconveniences attending its use are felt, as slight colic and diarrhœa, or headache and giddiness,—and then the doses should be diminished.

Colchicum is supposed to have been the active ingredient of a once celebrated French nostrum for Gout, the *Eau médicinale d'Husson.* (P. J. xi. 436.)

Dose.—The corm (bulb) or the powdered seeds may be given in doses of gr. j.–gr. v. three times a-day, with aromatics and sometimes a little opiate. Mr Wigan recommends it in 8-grain doses every hour, until either vomiting, purging, or sweating is experienced.

EXTRACTUM COLCHICI, B. Extract of Colchicum.

Prep.—Crush the fresh corms of the Colchicum, deprived of their coats; press out the juice; allow the feculence to subside; heat the clear liquor to 212° (to coagulate albumen). Strain through flannel, and evap. at 160°.

Action. Uses.—An efficient preparation, in doses of gr. j. every three or four hours.

EXTRACTUM COLCHICI ACETICUM, B. Acetic Extract of Colchicum.

Prep.—B. Same as above, adding Acetic acid ℥vj. to each ℔vij. of the crushed corm.

It is stronger than the L. prep., in which the juice was not filtered, so that the starchy matter of the root was retained.

Action. Uses.—Anodyne, &c., in Gout and irregular Rheumatism, in doses of gr. ß–gr. ij. three or four times a-day. D. Prep. stronger.

[ACETUM COLCHICI, L. Vinegar of Colchicum.

Prep.—L. Macerate *Dried Colchicum Corm* ʒiijß, with *dil. Acet. acid* Oj. in a closed vessel for three days; then express and set aside, that the dregs may subside; lastly, add to the strained liquid *Proof Spirit* f℥jß.

Action. Uses.—A mild but efficient preparation, in doses of fʒß–fʒij., every three or four hours. Omitted in B. P.]

VINUM COLCHICI, B. Wine of Colchicum.

Prep.—B. Macerate for seven days dried and sliced *Colchicum Corm* ℥iv. in *Sherry Wine* Oj. Press and strain. Add sufficient Sherry to make Oj.

Action. Uses.—Irritant, &c. Sedative in doses of ♏x.–fʒj. three times a-day. The Wine of the Seeds is preferred by some (Seeds ℥ij. to Sherry Wine Oj.) in the same doses.

TINCTURA COLCHICI SEMINUM, B. Tincture of Colchicum Seed.

Prep.—B. *Bruised Colchicum Seeds* ℥ijß in *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—As the seeds are more uniform in strength than the corm, and as proof Spirit is a good solvent, this and the wine of the seeds are preferred by many practitioners.

Dose.—♏xv.–fʒß.

The bruising of the seeds should on no account be omitted. Bonnewyn finds that the spirit extracts a far larger amount of Colchicina from the seeds bruised than when left whole.

[TINCTURA COLCHICI COMPOSITA, L. Compound Tincture of Colchicum.

Prep.—B. Macerate for fourteen days *bruised Colchicum Seeds* ℥v. in *Aromatic Spirit of Ammonia* Oij. Express and strain.

Action. Uses.—Recommended by Dr Williams in cases where Acidity prevails, in doses of ♏x.–fʒj. The presence of Ammonia in this tincture should be borne in mind. Though much valued by many physicians, this preparation has been omitted in the B. P.]

[VERATRUM, L. Veratrum album, *Linn.* Rhizoma; Rootstock. White Hellebore.

White Hellebore is believed to be the Ἑλλεβόρος λευκός of Dioscorides, the *Khirbuk abiuz* of the Arabs.

Rootstock rugose, oblong, præmorse, rather horizontal; when dry it is of a brownish colour on the outside, but internally of a greyish colour, with long cylindrical radicles. The stem is 1½ to 4 feet high. Leaves plicate, elliptic, or elliptico-lanceolate, pubescent below, passing obliquely into the sheath. Racemes paniculate, terminal, pubescent. Flowers polygamous, yellowish-white, green at the back. Segments of 6-parted perianth oblong-lanceolate, denticulate, without glands at the base, spreading, much longer than the pedicle. Stamens 6, inserted into the base of the segments; anthers reniform, opening transversely. Ovary with 3 spreading stigmas. Capsules 3, united below, horned above, separating into 3 many-seeded follicles. Seeds compressed, or winged at the apex—Meadows in the south of Europe, and also in central Europe.—Nees von E. 46; St. and Ch. 136. *Veratrum Lobelianum* may be used for the same purposes.

All parts of this plant are acrid and poisonous; but the rootstock with its radicles is alone officinal. It seems when first tasted a little sweetish, but its bitter and acrid disagreeable taste soon overwhelms every other. It is usually imported from Germany, and is rough with the remains of the detached radicles. The properties depend chiefly on the presence of *Veratria*, but another alkali has been detected by E. Simon, which he has called *Jervine*, from the Spanish word signifying poison. The other constituents resemble those of the Cormus of Colchicum.

Action. Uses.—Irritant Poison. Applied to the nose, it produces sneezing and coryza, and when taken internally, vomiting and purging. It used to be employed as a Hydragogue Cathartic, and before Colchicum as an anodyne in Gout. It is now chiefly employed to destroy vermin infesting the skin or hair; sometimes as an Errhine, one or two grains being mixed with Starch or Florentine Iris.

VINUM VERATRI, L. Veratrum Wine.

Prep.—Macerate *sliced White Hellebore* ℥viij. in *Sherry Wine* Oij. for seven days. Strain.

Action. Uses.—Emetic, Cathartic, Anodyne. Sometimes used in Gout and Rheumatism, in dose of ♏x. thrice a-day, with a little Laudanum.]

VERATRI VIRIDIS RADIX, B. Veratrum Viride, *Willd.* The dried rhizome. Green Hellebore Root. (Collected in autumn in the United States and Canada.)

This is a new introduction from the American Pharmacopœia. *Veratrum viride* is known in the U. S. as *American Hellebore*, *Swamp Hellebore*, *Indian Poke*, and *Poke Root.* Its action has been described by Dr C. Osgood in the *Amer. Journal of Med. Sciences*, vol. xvi. It is irritant externally, and given internally acts as an emetic, or, in smaller doses, reduces the frequency and force of the pulse, producing at the same time faintness, somnolency, vertigo, headache, dimness of sight, dilated pupils. It resembles the White Hellebore and Colchicum in its influence on the system, but has a special power over the heart and pulse, which is thought to render it applicable in acute inflammations. Dr Norwood of South Carolina has employed it in pulmonary inflammation, acute rheumatism, and typhoid fever.

VERATRUM VIRIDE, *Willdenow.* Root or rhizome thick and fleshy, upper part truncated, lower fleshy, with numerous white radicles. Stems annual, round, striated, pubescent, solid, 3–6 feet high, with green bright leaves terminating in a panicle of greenish yellow flowers. Leaves decreasing in size as they ascend, lower 6–12 inches long, oval-acuminate, pubescent, waved, plaited, amplexicaul. Upper leaves oblong, lanceolate. Panicle of numerous flowers in racemes with downy peduncles. Each flower with downy pointed bract, longer than pedicel. Perianths in 6 oval-acute segments, 3 longer than others. Stamens 6, filaments recurved. Pistils 3, styles recurved. Fruit of 3 capsules, separating at top, and along inner side. *Hab.*—Swamps, wet meadow, and banks of streams, from Canada to the Carolinas.

The shrivelled rhizome and its fibres resembles the root or rhizome of the *Veratrum album.* American Hellebore has a bitter, acrid taste, and no smell. It contains Veratria, to which probably its properties are due. It depresses the action of the heart, and in large doses is emetic; 4–6 grains of the powder, or ʒj.–ʒij. of the tincture, are an emetic dose. Smaller doses than this are given as antiphlogistic in gouty, rheumatic, and neuralgic affections. In large doses it is a powerful depressent, and a dangerous poison. It must, therefore, be used with much caution.

TINCTURA VERATRI VIRIDIS, B. Tincture of Green Hellebore.

Prep.—B. Take of *Green Hellebore Root*, in coarse powder, ℥iv., *Rectified Spirit* Oj. Prepare as Tinctura Aconiti.

Dose.—♏v.–♏xx. In Gout, Rheumatism, &c., with caution.

SABADILLA, B. Asagræa officinalis, *Lind.* The Dried Fruit. Cevadilla. (Imported from Vera Cruz and Mexico.)

Sabadilla, Cevadilla, or Cebadilla (from *Cebada*, the Spanish for Barley, from the resemblance of its flowering spike to an ear of barley), was known to Monardes in 1573. Its seeds, or rather fruits, have been occasionally employed for the destruction of vermin; they are now recognised as the source for obtaining the alkaloid Veratria. Cevadilla was long supposed to be the fruit of *Veratrum Sabadilla*, Retz., but Schiede discovered that it was produced in Mexico by a different plant, which was first referred to Veratrum, then to Helonias, and is now formed into a new genus, Asagræa.

ASAGRÆA OFFICINALIS, *Lindl.* Bulbous. Plants cæspitose. Leaves linear, grass-like, tapering, smooth, channeled above, carinate below, 4 feet long, lax. Scape naked, 6 feet high, simple. Raceme very dense, 1½ foot long. Flowers polygamous, racemose, naked, yellowish-white. Perianth 6-partite, segments linear. Stamens alternately shorter; anthers cordate, after dehiscence shieldshaped. Ovaries 3, simple. Stigma obscure. Follicles 3, papery. Seeds scimitar-shaped, winged. Eastern side of the Mexican Andes.—Nees von E. Suppl. 4.

This plant is officinal for the preparation of Veratria.

Cebadilla or Sabadilla seeds, as they are called, consist of the loose seeds and the 3-celled, thin, dry follicles, about half an inch long, of a reddish-grey colour, which are either empty, or contain each two brownish-black seeds, without odour, but having a bitter, acrid, and persistent taste. Analysed by Pelletier and Caventou, they were found to resemble the corm of Colchicum in composition, as they contain Fatty matter composed of Stearine, Elaine, and Cevadic acid, Wax, Veratria in combination with an excess of Gallic acid, Yellow Colouring matter, Starch, Lignin, Gum, with some saline substances. (*See* Merat and De Lens.) A more elaborate analysis has been given by Meissner.

Action. Uses.—Anthelmintic.

VERATRIA, B. Alkaloid prepared from Cevadilla, (not quite pure.)

Veratria was first discovered in the Sabadilla seeds, and subsequently in the rootstock of *Veratrum album*, and in both in combination with Gallic acid in excess.

Prep.—B. Take of *Cevadilla* ℔ij.; *Distilled water*, a sufficiency; *Rectified Spirit*, a sufficiency; *Solution of Ammonia*, a sufficiency; *Hydrochloric acid*, a sufficiency; *Purified Animal Charcoal*, gr. lx. Macerate the Cevadilla with half its weight of boiling Distilled water in a covered vessel for twenty-four hours. Remove the Cevadilla, squeeze it, and dry it thoroughly with a gentle heat. Beat it now in a mortar, and separate the seeds from the capsules by brisk agitation in a deep narrow vessel, or by winnowing it gently on a table with a sheet of paper. Grind the seeds in a coffee-mill, and form them into a thick paste with rectified Spirit. Pack this firmly in a percolator, and pass rectified Spirit through it till the Spirit ceases to be coloured. Concentrate the spirituous solution by distillation, so long as no deposit forms, and pour the residue, while hot, into twelve times its volume of cold Distilled water. Filter through calico, and wash the residue on the filter with Distilled water, till the fluid ceases to precipitate with ammonia. To the united filtered liquids add the Ammonia in slight excess, let the precipitate completely subside, pour off the supernatant fluid, collect the precipitate on a filter, and wash it with Distilled water till the fluid passes colourless. Diffuse the moist precipitate through twelve fluid ounces of Distilled water, and add gradually with diligent stirring sufficient Hydrochloric acid to make the fluid feebly but persistently acid. Then add the Animal Charcoal, digest at a gentle heat for twenty minutes, filter, and allow the liquid to cool. Add Ammonia in slight excess, and, when the precipitate has completely subsided, pour off the supernatant liquid, collect the precipitate on a filter, and wash it with cold Distilled water till the washings cease to be affected by nitrate of silver acidulated with nitric acid. Lastly, dry the precipitate first by imbibition, with filtering paper, and then by the application of a gentle heat.

The seeds, being separated, are acted on by spirit, which dissolves Gallate of Veratria, resin, and colouring matter. The tincture being concentrated by evaporation and poured into 12 volumes of water, most of the resin is precipitated. Ammonia being added, precipitates Veratria, which is freed from most of the colouring matter by washing. The Veratria is dissolved in H Cl, further decolorised by Animal Charcoal, again precipitated by Ammonia, washed, and dried. As thus obtained it is not quite pure, but pale-grey and amorphous, when dissolved in dilute acids "leaving traces of an insoluble brown residual matter." B.

Veratria is pulverulent and not crystallisable. It is inodorous, but its powder in the most minute quantity powerfully irritates the nostrils. When melted, it becomes on cooling a transparent yellowish mass; and burns entirely away when ignited in the air. In cold water it is nearly insoluble; boiling water takes up 1-1000th of its weight, and the solution is acrid; Alcohol and Ether dissolve it but sparingly. It restores the blue colour of Litmus, and forms neutral salts with acids, which crystallise with great difficulty. Pure Veratria is reddened by strong Sulph. acid, and forms with Nit. acid a yellow solution. Its solutions are precipitated by Ammonia and by tincture of galls. According to Couerbe, the Veratria of commerce contains, besides Veratria, another peculiar principle, called *Sabadillina*, and 2 distinct resinous bodies. Veratria is composed of $C_{64} H_{52} N_2 O_{16}$. It is an active poison.

Action. Uses.—Irritant Poison. In small doses applied externally acts as a Rubefacient; also as an Errhine; excites violent sneezing; taken internally, excites nausea, vomiting, and purging; has been applied externally in Neuralgia, Rheumatism, and Gout, after the acute symptoms have been mastered. In doses of $\frac{1}{12}$ of a grain, it has been given internally in Gout, Rheumatism, and painful nervous affections, as a substitute for Colchicum. As a topical irritant in the above complaints it is used in the form of Ointment.

UNGUENTUM VERATRIÆ, B. Ointment of Veratria.

Prep.—Take of *Veratria*, gr. viij.; *Prepared Lard*, ℥j.; *Olive Oil*, fℨß. Rub the Veratria and the Oil together; then mix them thoroughly with the Lard.

SMILACEÆ, *R. Brown.* Sarsaparillas.

They are found in the temperate and tropical parts of Asia and America, but also beyond these limits. They are chiefly remarkable for yielding the root called Sarsaparilla.

SMILAX, *Linn.* *Diœcia Hexandria*, Linn.

Diœcious. Perianth 6-partite, nearly equal, spreading (female persistent). Stamens 6, inserted into its base. Anthers linear, erect. Ovary 3-celled. Cells 1-seeded. Style very short. Stigmas 3, spreading. Berry 1–3-seeded. Seeds sub-globular. Albumen cartilaginous. Embryo very small, remote from the umbilicus.—Evergreen climbing shrubs. Root fibrous or tuberous. Stems often prickly. Leaves alternate, petiolate, cordate or hastate, reticulate, venose; cirrhiferous stipules between the petioles. Flowers sessile on a globular receptacle, subcapitate, pedicellate, or umbellate. A few grow in temperate, but the majority in warm and tropical regions of both hemispheres.

SARSÆ RADIX, B. Smilax officinalis, *Humb.* and *Bonpl.* The dried Root. Sarsaparilla. *Jamaica Sarsaparilla.* (Native of Central America; imported from Jamaica.)

The word *Smilax* occurs in Greek authors, and their plant, *Smilax aspera*, continues to be employed in medicine. The name Sarsaparilla (from the Spanish *Sarsa*, a bramble, and *Parilla*, a vine) is applied to species of the same genus, and to their roots, first introduced into Europe from the New World in the 16th century. Several kinds, as

Jamaica, Honduras, Brazilian, &c., are known in commerce ; but it is extremely difficult, if not impossible at present, to determine the species of *Smilax* which yield the several varieties of drug, because much of it is brought over by the Indians from the little-known Mosquito coast to Jamaica, and thence imported into this country : the greater portion of the remainder being imported from Mexico, Guatemala, Brazil, and Peru.

SMILAX OFFICINALIS, *H. B.* and *Kunth*, was discovered by Humboldt and Bonpland in New Granada on the banks of the Magdalena, in Columbia. As its roots are collected by the natives, called *Zarzaparilla*, and taken to Cartagena, and thence exported to Jamaica, it is more than probable that this yields some of the Sarsaparilla of commerce; hence it is adopted in the Pharmacopœias. Dr Pereira concludes it to be probably the source of Jamaica Sarsaparilla. Martius states that, according to Pohl, the roots are collected in the western parts of the province of Minas Geraes.

S. PAPYRACEÆ, *Poir*. (S. syphilitica, *Mart.* non Humb.), is a native of Brazil. Martius ascertained that its roots were collected by the Indians on the Rio Negro and other places in the vicinity of the Amazon river, and that they form the *Salsa*, *Salsaparilla*, *Sarza*, or *Zarza*, which is named the Sarsa of Maranhao, of Para, and of Lisbon, and that it abounds more than the others in Parigline.* The leaves, &c., of a species of Smilax were sent by Mr Skinner to the late Dr Pereira, having been collected in Guatemala. Examined by Mr Bentley, they were pronounced to belong to *S. papyracea*. Along with the specimen was sent a bundle of unfolded roots, which much resembled those of Honduras Sarsaparilla, whence Mr Bentley thinks it possible the latter also may be the produce of this species.

S. SARSAPARILLA, *Linn.*, is a native of the United States of America; but it does not, according to the evidence of American authors (*see* Wood and Bache), yield any of the Sarsaparilla of commerce.

S. SYPHILITICA, *Willd.*, is a distinct species, found by H. and B. on the Rio Cassiquiare, in Brazilian Guiana.

S. MEDICA, *Schlecht*, was found by Schiede on the eastern slope of the Mexican Andes. The roots are dried and exported from Vera Cruz, but are little known here.

S. ASPERA is a native of the East. At the bazaars of Constantinople and Gallipoli, according to Landerer, its stalks and yellow and black fruits are sold as Sarsaparilla, and thought even to excel the genuine officinal kind in efficacy.

Dr Hancock states that there is but one species that yields genuine Sarsaparilla which manifests to the taste any of the sensible properties of Sarsaparilla ; and this grows chiefly on the elevated lands of the Rio Imiquem, at Unturana and Caraburi ; also that the Sarsa of the Rio Negro, which comes by way of Angostura or Para, is the best. This is probably yielded by the above *S. papyracea* (or *S. officinalis ?*) Several other species are, however, enumerated by Martius, as *S. Japicanga*, *brasiliensis*, and also *Herreria Salsaparitha*, as employed for the same purposes, and he says "Recentes multo efficaciores, quam exsiccatæ, vetustæ." So *S. Cumanensis*, the *Azacoreto* of the natives, *S. cordato-ovata* of Pöppig, *S. Perhampuy*, referred doubtfully to *S. officinalis* by Dr Lindley, *S. China*, yielding the *China-root* of the shops, long famed in the East. It is probable that some of the Indian species are possessed of similar virtues. (See *Himal. Bot.* p. 383.)

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* "Ejus radices præ cæterarum Smilacum pollent materia illa extractiva, saporis amaricantis, fauces vellicantis, *Parillinum* dicta, cui efficacia medicaminis præcipue debetur."

Dr B. Seeman (in a paper read before Linn. Soc. Dec. 6, 1853) stated also his belief that all the Sarsaparilla of commerce is derived from one species, the above *S. officinalis* of H. and B., and that *S. medica*, Schl., and *S. papyracea*, Poir, are identical with it. He considered the difference between the various Sarsaparillas to depend partly on the mode of preparation, the rootstock being removed from some, and the rootlets stripped off from other kinds; partly on natural causes, the mealy and non-mealy varieties depending on the age of the plant or the soil of the locality where they are collected.

Sarsaparilla roots are usually imported in bundles, formed of the roots folded up,—or unfolded, as in the Brazilian variety,—frequently still adhering to the *rhizoma* (chump of druggists). These roots are flexible, several feet in length, about the thickness of a quill, cylindrical, but wrinkled longitudinally, with radicles attached along their length. The colour varies, probably owing to adventitious circumstances. They are composed of a thick cellular cortex, covered by a thin epidermis; of the meditullium or duramen, an inner layer of ligneous intermixed with cellular tissue; and of a central pith, often containing Starch, in the interior. Hence a transverse section resembles one of an exogenous stem without medullary rays. Sarsaparilla is without odour, often with little else than a mucilaginous taste; but when good and fresh it is a little bitter, nauseous, and acrid, a taste which affords, according to Dr Hancock, the best criterion of its goodness. The roots are often split up the middle and cut into short pieces, for the facility of making preparations. In this it is more difficult than in the entire state to distinguish the different kinds.

Jamaica Sarsaparilla, which is mentioned in the B. P., and usually the most esteemed, is in bundles of from 12 to 20 inches in length, and from 4 to 5 in breadth. It is distinguished from other kinds by its reddish colour, and by having more rootlets attached to it; hence it is sometimes called *red-bearded* Sarsaparilla. It is less mealy, but yields more extract, than the other kinds, and the bark is said to afford five times more than the woody part. (Pope.) Its powder is of a reddish colour, and does not produce so blue a colour as the Honduras, and similar kinds, when tested with Iodine. Jamaica Sarsaparilla is the kind intended by the Pharmacopœias. It is chiefly brought to Jamaica from Central America, and is probably the produce of *S. officinalis*.

Brazilian, called also *Lisbon* and *Rio Negro* Sarsaparilla, ought to be of as good quality as any other, if yielded by the above *S. papyracea*, for this, according to Martius, has the sensible properties more marked than other species. It may be the plant alluded to by Dr Hancock. Some is yielded perhaps also by the *S. cordato-ovata*. The roots are in bundles of from 3 to 5 feet in length, and not folded up, nor with the chump attached; are less wrinkled longitudinally, have fewer radicles, a reddish-brown colour, and are amylaceous.

The *Honduras* Sarsaparilla is greyish-brown in colour, and, like the last, has but few radicles attached, is very amylaceous, so as to appear mealy when broken, and becomes blue, when either its powder or decoction is tested by Iodine. The bundles are folded, and the chump is sometimes found.

The *Guatemala* Sarsaparilla described by Mr Bentley resembles that of Honduras, but the roots are unfolded. Both are perhaps yielded by the same species (*S. officinalis*, or *papyracea ?*)

Lima Sarsaparilla, though originally brought from Lima, is also imported from Valparaiso and Costa Rica (*Per.*) On account of its resemblance to Jamaica Sarsaparilla, it is often sold for it. It is folded in bundles 3 feet long, and 9 inches across, having the chump still attached, and contained in the interior.

A sixth kind, called *Vera Cruz* or *gouty Sarsaparilla*, is said to be exported from the Caraccas, in South America. The roots are folded ; they are coarse, thick, and amylaceous, and have the chump attached.

Sarsaparilla roots are sometimes adulterated, and the inferior are often passed off for superior kinds. The roots of *Agave*, and of *Furcræa*, also of *Herreria stellata*, and *Aralia nudicaulis*, and even the stems of Dulcamara and of the Hop, are substituted. Those of *Phormium tenax* have been likewise used for Sarsaparilla.

Sarsaparilla contains much Lignin, Starch, and Mucilage, a little Acrid Bitter Resin, a trace of Volatile Oil (which has the odour and acrid taste of Sarsaparilla), and a pecular principle, which has been variously named. *Smilacine* is white, crystallisable, without odour, but with a bitterish taste ; very slightly soluble in cold, more so in boiling water ; soluble in hot spirit, also in Ether and Oils. Strong Sul′ turns it first red, and finally yellow. H Cl dissolves it, and becomes red. As Smilacine is neutral, and forms no definite compounds, its composition is uncertain. The active properties of Sarsaparilla are taken up both by hot and cold water, but are impaired by long boiling. They are also extracted by diluted Spirit ; a little addition of this, in making its preparations, is probably useful, but long boiling is positively injurious.

Action. Uses.—Alterative, Diaphoretic ; will sometimes create nausea and vomiting. Improves the state of the constitution, slightly strengthens and induces plumpness in Cachectic cases, and in depraved states of the general health; useful in secondary Syphilis and Mercurio-Syphilitic cases. Many ascribe its supposed good effects to the care bestowed on the comfort and diet of the patient.

Decoctum Sarsæ, B. Decoction of Sarsaparilla.

Prep.—B. Take of *Jamaica Sarsaparilla*, cut transversely, ℥ijß; *boiling Distilled water*, Ojß. Digest the Sarsaparilla in the Water for an hour; boil for ten minutes in a covered vessel, cool and strain. The product should be made up to Oj.

(Similar to the Decoction of the L. P. of 1851.)

(In the L. P. of 1836 a tedious process was described; first, long boiling, then taking out and bruising, then boiling again. It was said to have been prompted by an erroneous notion that the activity resided in the woody fibre of the root.)

Action. Uses.—Alterative. Much used in doses of f℥iij.–f℥vj. two or three times a-day.

Decoctum Sarsæ Compositum, B. Compound Decoction of Sarsaparilla.

Prep.—B. Take of *Jamaica Sarsaparilla*, cut transversely, ℥ijß; *Sassafras*, in chips, ℥¼; *Guaiac Wood turnings*, ℥¼; *Fresh Liquorice Root*, bruised, ℥¼; *Mezereon*, gr. lx.; *boiling Distilled water*, Ojß. Digest all the ingredients in the water for an hour; boil for tèn minutes in a covered vessel; cool and strain. The product should be made up to Oj.
(Similar to the Comp. Decoction of the L. P.)

Action. Uses.—Alterative. A substitute for the *Lisbon diet drink*, in doses of f℥iij.-f℥vj. two or three times a-day.

Extractum Sarsæ Liquidum, B. Liquid Extract of Sarsaparilla.

Prep.—B. Take of *Jamaica Sarsaparilla*, cut transversely, ℔j.; *Distilled water*, at 160°, Oxiv.; *Rectified Spirit*, f℥j. Macerate the Sarsaparilla in one half of the water for six hours, and decant the liquor. Digest the residue in the remainder of the water for the same time, express and filter the mixed liquors, and evaporate them by a water bath to f℥vij., or until the specific gravity of the liquid is 1·13. When cold, add the Spirit. The specific gravity should be about 1·095.
(Of very nearly the same strength as the *Fluid Extract* of the L. P.)

Action. Uses.—Alterative in doses of fʒij.–ʒiv. with water, flavoured as agreeable. It may be preserved for any time.

[Syrupus Sarsæ, L. Syrup of Sarsaparilla.

Prep.—L. Boil *Sarsaparilla* ℔iijß in *Aq. dest.* Cij. down to Cj.; pour off and strain, hot. Again boil the residue in *Aq.* Cj. down to ½, and strain. Evaporate the mixed liquor to Oij., and dissolve in it *Sugar* ℥xviij. Lastly, when cool, add *Rect. Spirit* f℥ij.

Action. Uses.—Alterative, in doses of fʒiv. with water, or added to the Decoction.]

Orchideæ, Juss. Orchids.

The *Orchideæ*, though so interesting to horticulturists, are of little importance for their uses. The Vanilla, however, is remarkable for its aromatic fragrance, and some of the family yield the highly nutritious tubers known by the name of Salep, Salop, and Saloop. This name seems to be derived from the Arabic *Salib*. Their radical tubers are hard and horny in appearance, whitish, semi-transparent, with little odour, but a mild mucilaginous taste. They are composed chiefly of Bassorin, with some soluble Gum, and a little Starch, and are regarded by many as containing the largest portion of nutritious matter in the smallest space possible. The plant yielding the finest kind, a produce of the Persian region, is imperfectly, if at all known. A plant brought to Dr Royle from near Cashmere he named *Eulophia vera*, and he himself prepared some very good Salep from the tubers of *E. campestris*, found at the foot of the Himalayas in North West India (*see* Himal. Bot. p. 370). Dr Falconer informs Dr Royle that he was told by Dost Mahommed that the finest Salep is produced near Candahar. Sprengel considers *Orchis papilionacea* to be the Orchis or Salep of the ancients. M. Beissinhirtz says that *Orchis morio*, *mascula* and *militaris*, yield the best Salep in Europe.

Dr Cullen writes, "I have seen it prepared in this country from *Orchis bifolia*, as pure and as perfect as any that comes from Turkey."

Salep forms a nutritious and unirritant diet for the sick, convalescents, or children, boiled with water or milk, and flavoured as Sago and other farinaceous foods.

CANNEÆ, *R. Brown.* *Marantaceæ*, Lindl.

The Canneæ resemble Musaceæ in habit, and are very closely allied to Scitamineæ. They are found in tropical parts of Asia and America, and are destitute of aroma, but remarkable for the secretion of Starch.

[MARANTA, L. Maranta arundinacea, *Linn.* Tuberis Fæcula. Fecula of the Tubers. Arrowroot. *Monandria Monogynia*, Linn.

The fecula, root-stocks, and tubers of this plant have long been familiar to the inhabitants of S. America; but West Indian Arrowroot has only been used in England during this century.

Rootstock white, horizontal, annulated, from which proceed root-fibres, some of which swell into tubers, and become jointed stocks, similar to the rhizoma, but covered with scales. These often elongate, curve upwards, and rising out of the ground become new plants. (*See* Nees and Ebermair, Pfl. Med. 69 and 70.) Stem 2–3 feet high, much branched, slender, finely hairy, tumid at the joints. Leaves alternate, with long, leafy, hairy sheaths, ovate, lanceolate. Panicles terminal, lax, spreading, with long, linear, sheathing bracts at the ramifications. Calyx green, smooth. Corolla white, small, unequal, one of the inner segments in the form of a lip. Anther attached to the petal-like filament. Style hooded, petal-shaped. Ovary 3-celled, smooth. Stigma 3-sided. Fruit, even, dry, 1-seeded.

The Starch, or Arrowroot, is obtained by beating into a pulp one-year old tubers (the Rhizoma does not seem to be used, either of this or of the Curcumas, *q. v.*), then throwing this into water, agitating and straining it so as to separate the amylaceous from the fibrous portion. The Starch suspended in the water gives it a milky appearance. When allowed to stand the fecula subsides, is washed with a fresh portion of water, and afterwards dried in the sun. It is then snow-white, and is composed of minute granules, which are seen by the microscope to be more or less elliptical in form, often like a mullar in shape, rarely quite spherical or ovate. Many are only a 2000th, others as much as a 750th of an inch in length.

Some Arrowroot is also produced in the West Indies by a plant there called "Tous les Mois," referred to in the E. P. as "An imperfectly determined species of Canna." This by some, as Dr Waterson of St Kitt's, is stated to be *C. coccinea.* Dr Hamilton describes it as cultivated at Barbadoes, St Kitt's, and the French islands, as attaining in rich soils a stature of fourteen feet, and having tuberous roots, equal in size to the human head. He suspects it may be identical with the Achira of Choco. This is the *Canna edulis* of the Bot. Reg. ix. 775. This plant was therefore officinal in the D. P. The starch grains of Tous les Mois are very large.

Besides the W. Indies, the *Maranta* is now cultivated with great success at Natal, and in other British colonies.

In India, *Maranta arundinacea* has been successfully cultivated near Calcutta. Some Arrowroot is yielded by another species, *M. ramosissima*. Besides these, much (called *East Indian Arrowroot*) is yielded by *Curcuma angustifolia, leucorrhiza, rubescens*, &c.; but the greater portion of the Arrowroot exported from India is produced in Travancore, and we have no information respecting the species which yields it, as *Curcuma angustifolia* has not been proved to be indigenous there. Some is also made in India from the tubers of *Ipomœa Batatas*. In Europe Potato Starch is often substituted for Arrowroot. (*See* AMYLUM.)

Action. Uses.—Arrowroot participates in all the properties of Starch (*q. v.*), and is Nutritious and Demulcent. Well adapted for the diet of the sick, convalescents, and for infants when weaned. Used as a Demulcent in Urinary and Bowel complaints. Arrowroot makes a firmer jelly than most of the feculas, with the exception, perhaps, of that of Tous les Mois.]

SCITAMINEÆ, *R. Brown*. Zingiberaceæ, *Lindl.*

The Scitamineæ, peculiar in habit, are most closely allied to Canneæ. They
are remarkable for yielding a variety of spices, as Ginger, the various Carda-
moms, and others now less known in Europe, as Zedoary, Zerumbet, Galangal;
and they contain the Curcumas, which, besides Turmeric, &c., yield Starch, or
Arrowroot.

ZINGIBER, B. Zingiber officinale, *Roscoe*. The Rhizome, scraped and dried. Ginger. (From plants cultivated in the West Indies, India, and other countries.) *Monandria Monog.* Linn.

Ginger, the ζιγγίβερις of Dioscorides, and the *Zinjábil* of the
Arabs, seems to derive its name from the Sanscrit Shringaveram.
Pliny says it was thought to be the root of Pepper, and called
Zimpiperi,—"quanquam *sapori simile*."

Rootstock biennial, creeping. Stem annual, erect, 3 or 4 feet high, enclosed
in the sheaths of distichous leaves. Leaves subsessile, linear-lanceolate, smooth.
Spikes radical but elevated, oblong-obovate, strobiliform, formed of single-
flowered, imbricated, acute bracts. Corolla with outer limb 3-parted, the in-
erior unilabiate. Lip 3-lobed. Anthers double, crowned with a single incurved
eak. Capsule 3-celled, 3-valved. Seeds many, arilled.—Cultivated in Asia
nd also in America.—Nees von E. t. 61.

Ginger is propagated by planting cuttings of the rootstocks of the
lant. When the rhizome is young it may be preserved in syrup,
aving been first scalded and scraped; it then forms the much
steemed *Preserved Ginger*. In the autumn the rhizomes are taken
p, and scalded in hot water, to stop the vegetative principle: they
re then dried, without scraping, when they form what is called
lack Ginger, or, being scraped, they become *White Ginger*. But
is said that there are also differences in the plants, as there are
all which have been long cultivated. We require further in-
rmation on the subject. Most of the *Black* or unscraped Ginger
f commerce is brought from the East Indies, where it is cultivated

both in the plains and mountains. The *White* Ginger comes principally from the West Indies, but some has lately been exported from Malabar. Much is further whitened by being bleached with Chloride of Lime, &c. Both kinds are remarkable for their warm and fiery but grateful aromatic taste, and yield their principles both to water and to spirit. The B. P. describes White Ginger as in "irregular lobed decorticated pieces, three or four inches long, subcompressed, yellowish-white but not chalky on the surface, with a short mealy fracture, hot taste, and agreeable aroma. Powder yellowish-white." Ginger consists of Lignin, Starch, Gum, Bassorin, acidulous Extractive, a yellow acrid Volatile oil, and some soft, very acrid Resin.

The Vol. oil has the composition $C_{10} H_8$, and belongs therefore to the Camphine series. It has a Sp. Gr. of ·893, and a burning aromatic taste, with the odour of Ginger in a high degree.

Action. Uses.—Grateful and Warm Aromatic. Rubefacient. Errhine, Sialagogue. Stimulant Stomachic, much used to give a tone to the Stomach, and in Flatulence. Used also as a condiment and as an addition to various officinal preparations, chiefly aromatic and purgative compounds. Besides the Syrup and Tincture, the effects may be obtained from its powder, in doses of gr. x.–gr. xx., or the Essence, which is a concentrated Tincture, or from Lozenges made with it.

TINCTURA ZINGIBERIS, B. Tincture of Ginger.

Prep.—B. *Ginger*, in coarse powder, ℥ijß, in *Rectified Spirit* Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Warm Carminative Adjunct, in doses of ♏x.–fʒj.

TINCTURA ZINGIBERIS FORTIOR, B. Strong Tincture of Ginger. *Essence of Ginger.*

Prep.—Take of *Ginger*, in fine powder, ℥x.; *Rectified Spirit*, a sufficiency. Pack the Ginger tightly in a percolator, and pour over it carefully Oß of the Spirit. At the expiration of two hours add more Spirit, and let it percolate slowly until Oj. of tincture has been collected.

Introduced in 1867. 1 part in 2 of Ginger. A strong carminative, 2–3 drops for a dose. Used in making the Syrup.

SYRUPUS ZINGIBERIS, B. Syrup of Ginger.

Prep.—B. Mix with agitation *Strong Tincture of Ginger* ʒvj., *Syrup* ℥xix.

Action. Uses.—A pleasant adjunct to draughts, &c., in doses of fʒj.–fʒij.

CURCUMA, (B. Appendix.) Rootstock of Curcuma longa, *Linn.* Turmeric.

Curcuma appears to be the *κύπειρος Ἴνδικος* of Dioscorides ; but the name is no doubt derived from the Persian name *kurkoom.* Turmeric is extensively cultivated in almost every part of India, being employed as a condiment by the natives.

Rhizoma perennial, having many elongated ramifications, like it, yellow in colour; with numerous root-fibres proceeding from the rhizoma, many of which, as in the Maranta (*see* p. 686), swell into white tubers. The leaves are all radical, bifarious, with long sheathing petioles, broad, lanceolate, of a uniform green. The scape rises from the midst of the leaves, is short, and formed into a spike by numerous imbricated and united bracts, in the lower only of which are from 3 to 5 flowers, supported by bracteoles. Corolla with a tube gradually enlarged upwards; limb double, each 3-parted. Anther double, incumbent, bicalcarate at the base. Style capillary. Capsule 3-celled. Seeds numerous, arillate. Cultivated in India, China, and Java.—Bot. Reg. t. 1825; Nees von E. 59 as *Amomum Curcuma*.

The ramifications of the rootstock form Turmeric, while Arrowroot is procured from the white tubers, as in Maranta, *q. v.* The Turmeric is sometimes divided into *round* and *long* kinds, but there are a great many varieties. Both *round* and *long* pieces are found on the same plant. The latter is most common, about the size of the little finger, curved, pointed, and marked externally with transverse annular wrinkles, of a yellow colour, but somewhat of a reddish-brown internally. The powder is of a bright-yellow colour. The odour of Turmeric is peculiar, usually very conspicuous in Curry Powder. The taste is warm and bitterish, but spice-like. It contains a yellow Starch, a yellow colouring matter, and an odorous acrid Volatile Oil (*Curcumin*).

Action. Uses.—Turmeric is a mild aromatic, and much employed as a condiment. It is also used in dyeing. It is officinal chiefly for making Turmeric paper (unsized paper steeped in Tincture of Turmeric, ℥j. to ℥vj., and dried by exposure to the air), this being turned from a yellow to a reddish-brown by an alkali, and thus affording a ready method of detecting any alkaline excess.

CARDAMOMUM, B. The dried Capsules. Elettaria Cardamomum, *Maton.* (The Seeds to be separated from the Pericarps when required for use.) The Lesser, Officinal, or Malabar Cardamom. *Monand. Monog.* Linn.

Cardamoms were probably the καρδάμωμον of the Greeks, as they are produced in the same tract as Pepper, though it is difficult to prove the point. A great variety are known, and have been ably examined by Dr Pereira in his Elements ; but it is very difficult to refer them to their respective plants. The "Malaguetta Pepper," or "Grains of Paradise," which are exported from Sierra Leone, and largely employed in England for the adulteration of beer, are produced mainly by *Amomum Granum Paradisi*, Afzel.; and various rare kinds of Cardamom, not employed in medicine, are known to be yielded by other species of the genus *Amomum*, which is closely allied to *Elettaria*.

There is no doubt, however, that the officinal Cardamom is produced in Wynaad and Coorg, on the Malabar coast, and by the plant so fully described and figured by Mr White, and communicated by the Directors of the East India Company to the Linnean Society (*see* Trans. x. p. 229), as well as by Dr Roxburgh. (Fl. indica, ed. Wall. i. p. 68.) It was formed into a new genus *Elettaria*, by Dr

Maton, where it is best retained until a re-examination of the family can be made by a competent botanist.

Rhizoma with numerous fleshy fibres. Stems from 6 to 9 feet high. Leaves lanceolate, acuminate, pubescent above, silky beneath. Scapes or flowering racemes from the base of the stem compoundly flexuose, procumbent. Outer limb of the corolla in three oblong lobes, inner a single lip. Anther of two distinct lobes. Filament with two transverse lobes at the base, emarginate, and simple at the summit. Capsule of 3 cells and 3 valves, with a central receptacle. Seeds rough tunicated.—Trans. Linn. Soc. x. t. 4 and 5; Nees von E. 66; St. and Ch. 106.

The Cardamom plant springs up spontaneously after the felling of large trees and the clearing away of the undergrowth. In the February (or April, *White*) of the fourth year, four or five flowering suckers are seen to spring from the stem near the root. The fruit of these is ripe by the following November, when it is collected, and requires only drying in the sun.

Cardamoms in the capsule are from 4 to 7 lines long, from 3 to 4 thick, 3-sided, with rounded angles, obscurely pointed at both ends, longitudinally wrinkled, and of a yellowish-white colour. The seeds, when employed medicinally, must be removed from the capsules. They are small, angular, irregular, dotted on their surface, of a brown colour, easily reduced to powder. Varieties of Cardamoms are distinguished by the names of Shorts, Short-longs, and Longs, probably all produced by the same plant. Mr White describes the fruits as collected being separated into three or four sorts—head, middle, and abortive fruits. The odour of Cardamoms is fragrant, the taste warm, slightly pungent, and highly aromatic. These properties are

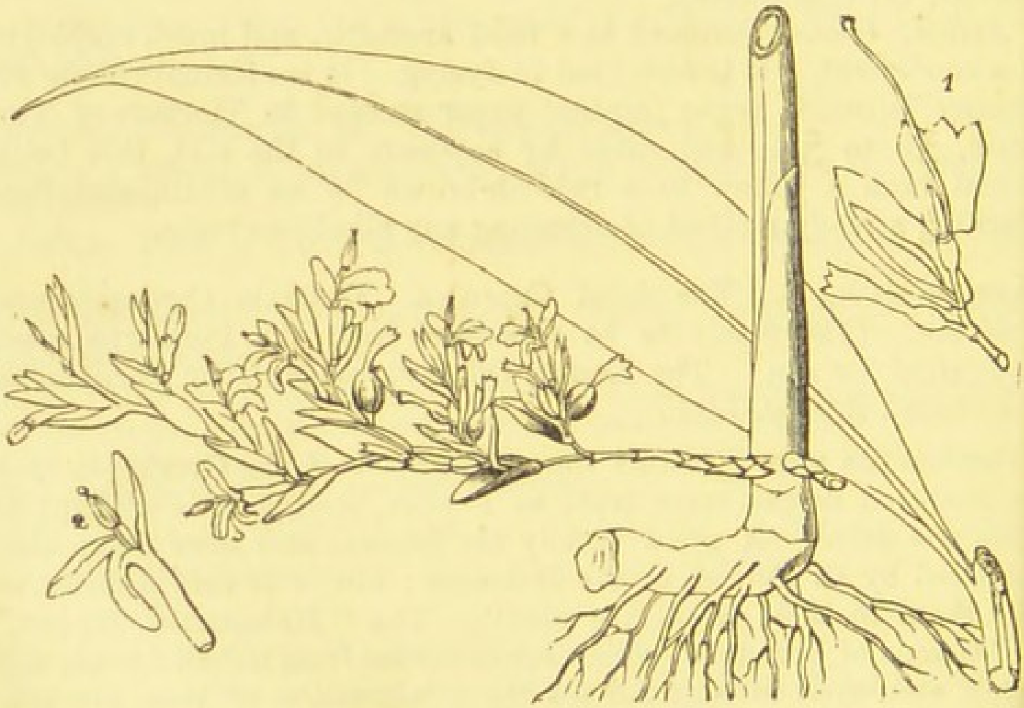

Fig. 98.

extracted by water and Alcohol, but more readily by the latter. They depend on a Volatile Oil (about 4 per cent.), which rises with water in distillation. The seeds also contain Fixed Oil 10·4. Alcohol extracts from them 12·5 per cent. of an acrid burning Resin and Extractive matter. The Lignin amounts to about 77 per cent.

TINCTURA CARDAMOMI COMPOSITA, B. Comp. Tincture of Cardamoms.

Prep.—B. *Cardamom seeds*, freed from the pericarps and bruised, ℥¼; *Caraway* bruised, ℥¼; *Raisins*, freed from their seeds, ℥ij.; *Cinnamon* bruised, ℥ß, *Cochineal*, in powder, gr. lx.; *Proof Spirit*, Oj. Prep. as Tinct. Aconiti.

Action. Uses.—Aromatic adjuncts to draughts, &c., in doses of fʒj.–fʒij. Contained in Decoct. Aloes Co., Mist. Ferri Aromat, Mist. Sennæ Co., Tinct. Chloroformi Comp.

Cardamoms are also contained in Ext. Colocynth. Comp., Pulv. Cinnam. Co., P. Cretæ Aromaticus, Tinct. Gentian. Co., Tinct. Rhei, and Vinum Aloes.

IRIDEÆ, *Juss.* Corn Flags.

The Irideæ are naturally allied to Orchideæ. They are found in temperate parts of the world. The rootstocks of different species of Iris have long been employed in medicine. *Iris florentina* yields Iris (orrice) root, which is collected chiefly near Florence and Leghorn, and being sent to other parts of the world, finds its way to India, where it is called *Bekhbunufsha* (violet-root). It has a pleasant odour, resembling that of the violet, a bitterish acrid taste, and contains much fecula, with an acrid volatile oil. It is now used chiefly to impart an agreeable odour to the breath, and its powder in perfumery; much used by the French for making small round balls to keep open issues. The Costus of the ancients (*koot* and *puchuk* of the natives) is often called Orrice-root in North-west India. It is the root-stock of *Aucklandia Costus verus*, one of the Compositæ.

CROCUS, B. Crocus sativus, *Linn.* The Stigma (and part of the style), dried. Saffron. (Imported from Spain, France, and Italy.) *Triandria Monog.* Linn.

Crocus is mentioned by Homer and Hippocrates; and as *Carcom*
n the Old Testament. It is the *kurkoom* of the Persians and *zafran*
f the Arabs.

The cormus (fig. 99) is roundish, and from its lower surface proceed numer-
us radicles. The leaves are 7 or 8 inches long, very narrow, traversed by a
hite midrib, and having long membranous sheaths at the base. They appear
ust as the flowers begin to fade. These are of a purplish colour, and make
heir appearance in autumn. They are axillary, with a 2-valved membranous
ath, funnel-shaped, with a long tube and 6-parted limb, the throat bearded.
amens 3, inserted into the tube. Anthers sagittate. Style filiform, with 3
ng linear stigmas, wedge-shaped and notched at apex, drooping on one side,
a deep orange-colour. Capsule oval, acuminate, 3-celled, many seeded.
eeds roundish.—Saffron was early cultivated in Egypt and Persia. Dr Royle
tained it from Cashmere. (*See* Himal. Bot. p. 2.) It has long been intro-
uced into Europe. Saffron Walden was so named from its being cultivated
here.

The stigmata are the chief officinal parts of the plant. These, with a portion of the style, are separated and carefully dried on paper by artificial heat. When dried, they form narrow shreds about an inch in length, of a brownish-red colour; and are called *Hay Saffron;* the produce of about 60,000 flowers is required to make up a pound. At other times the Saffron is pressed together, and forms what is called *Cake Saffron*, as is done with that of Persia, which is highly esteemed when imported into India; the Hay Saffron being the produce of Cashmere. But the Cake Saffron procurable

Fig. 99.

in the shops here is made up of Safflower (*Carthamus tinctorius*) an gum-water. (*Per.*) Saffron is now imported both from France an Spain, a little from other parts of Europe, and some from Bombay which must be the produce of Cashmere or Persia. Saffron mus necessarily be dear, from the space and labour required to produc even a small quantity; and therefore it is frequently adulterate with Safflower, with Marigold, or occasionally with shreds of drie beef. Old Saffron is sometimes oiled to make it look fresh, or tha from which the colour has been extracted is sold as good and fres Saffron.

Saffron has a strong aromatic odour and warm bitter taste; is of a deep orange-colour, which it imparts readily to water or to Spirit; and tinges the saliva yellow when chewed. "When rubbed on the moistened finger, it tinges it intensely orange-yellow." (B.) Analysed, it yielded of Volatile Oil 7·5, Gum 6·5, a yellow colouring matter (*Polychroite*) 65 per cent., the remainder consisting of Wax, Albumen, a little Saline matter, Lignin, and moisture. The properties depend on the Volatile Oil.

Action. Uses.—Slightly Stimulant, and highly esteemed in Eastern countries, as it formerly was in Europe. Much used as an ingredient in the cookery of the East, and in that of the Continent; but is chiefly employed here as a colouring ingredient; though sometimes given in nervous affections, in doses of gr. x.–ʒß. It forms an ingredient of some officinal compounds, as Pulvis Cretæ Aromaticus.

TINCTURA CROCI, B. Tincture of Saffron.

Prep.—*Saffron* ℥j. in *Proof Spirit* Oj. Prepare as Tinct. Aconiti.

Action. Uses.—Emmenagogue; used also as a Colouring ingredient.

[SYRUPUS CROCI, L. Syrup of Saffron.

Prep.—Macerate *Saffron* ℥v. in *boiling Aq.* Oj. in a covered vessel for twelve hours, then strain; add *Sugar* ℔iij., or q. s., and complete as with Syrupus Althææ (using *Rect. Spirit*).

Actions. Uses.—Useful as a colouring addition to draughts.]

ACORACEÆ. (Tribe of *Aroideæ*, Endl.)

Many of the *Aroideæ* secrete Fecula, often united with acrid principle; but as the Starch may be separated by washing, as in the case of what is called Portland Sago or Arrowroot, yielded by *Arum maculatum*, so the rootstocks of several form articles of diet in different countries.

ACORUS CALAMUS, *Linn.* Rhizome, or Rootstock of Common Sweet Flag.

The *ἄκορον* of the Greeks, the *wuj* of the Arabs, and *buch* of the Hindoos. It is no longer officinal.

Rhizoma thick, rather spongy, aromatic like every other part of the plant. Leaves erect, 2-3 feet high, about an inch broad, of a bright green colour. Stalk 2-edged or leaflike, but thicker below the spadix, which issues from one of the edges, about a foot above the root, 2 or 3 inches long, tapering, covered with numerous thickly set, pale-green flowers, characterised as in the family. Native of Europe and of moist and cool parts of India, also of North America. —St. and Ch. 32; Nees von E. 24.

The rhizoma, or creeping procumbent stem, which throws up eaves from its upper, and roots from its lower surface, is flattened, ointed, or marked with the semi-circular impressions of the leaves, f a light-brownish colour externally, with a reddish tinge in the nside. The odour is strong and aromatic, but not very agreeable;

the taste warm, bitterish, aromatic, and a little acrid. It contains Volatile Oil, Resin, Extractive, Salts, woody fibre, and water.

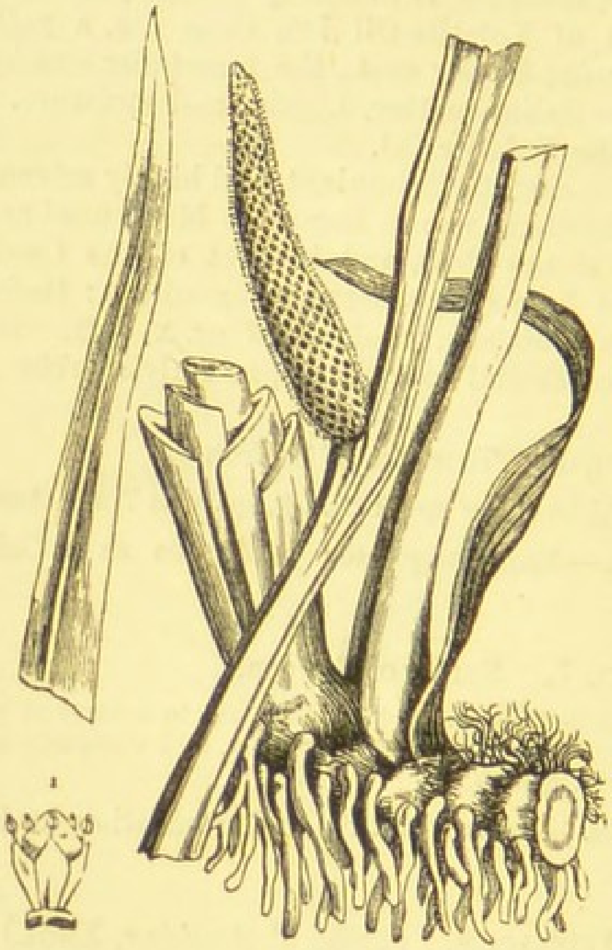

Fig. 100.

Action. Uses.—Aromatic Stimulant. Dr Royle has frequently prescribed it in conjunction with bitters, as the Chiretta and Bonduc Nut, and with success as an Antiperiodic in Agues. In powder in doses of gr. x.–gr. xx. ; or in infusion (℥jß–℥ij.–Oj. Aq.) in doses of f℥jß.

GRAMINEÆ, *Juss.* Grasses.

Grasses constitute the most important of vegetable families, being found in all parts of the world. Their herbaceous parts afford fodder for cattle, and secrete fecula in their seeds, which forms the chief food of mankind. Sugar is secreted by some, but especially by the Sugar-Cane, and a Volatile Oil by *Andropogon Calamus aromaticus*, Royle, and several other species. This oil, often called *Oil of Spikenard*, is extremely grateful for its fragrance, powerful as a stimulant, and especially useful as an embrocation, with one-half or two-thirds of Olive Oil, in rheumatism of the joints, &c. Silex is deposited on the surface of most grasses, as well as in the joints of the Bamboo, forming *Tabasheer*.

TRIBE *Aveneæ*.

[AVENA, L. Avena sativa, *Linn.* The Seeds. Common Oat. Groats.

The Oat (βρῶμος of Dioscorides) was known to the Greeks.

The Oat is distinguished among cereal grains by its loose panicle. Spikelets 3-2 flowered. Florets smaller than the glumes, naked at the base, alternately awned. Outer palea with lateral nerves, awned, ending in two points. Awn dorsal, kneed and twisted. Stamens 3. Ovary hairy at the top. Stigmas 2. Scales 2. Grain long, crested, and furrowed.—A native probably of the Persian region. Several varieties are cultivated in Europe.—Nees von E. 28.

The Grains of Oat when deprived of their integuments form *Groats;* these, when crushed, *Embden* and *Prepared Groats.* When the grain is kiln-dried, stripped of its husk and delicate outer skin, and then coarsely ground, it constitutes the *oatmeal* of Scotland. "The husk, with some adhering starch from the seed, is sold under the inconsistent name of *Seeds.*" (*c.*) Oats, according to Vogel, consist of 34 of husk and 66 per cent. of meal, and Oatmeal, in 100 parts, of 59 of Starch, 4·3 of Albuminous matter, Bitter Extractive and Sugar 8·25, Gum 2·5, with 23·95 of Lignin and moisture. Dr Christison finds as much as 72 per cent. of Starch in Oatmeal. It consists, therefore, of nearly five-sixths of real nutriment.

Action. Uses.—Groats and Oatmeal are nutrient and demulcent. When boiled with water (℥j. to Aq. Oj. boiled to Oſs) Gruel is formed, which is so useful as diet for the sick. Oatmeal, mixed to a thicker consistence, forms Porridge, and may be employed for making poultices.]

Tribe *Hordeæ.*

HORDEUM (DECORTICATUM), B. Hordeum distichon, *Linn.* The Seeds deprived of their husks. *Pearl Barley.* Common or long-eared Barley. *Triandria Digynia,* Linn.

Barley formed one of the ancient articles of diet (Exod. iv. 31, *see* Bibl. Cycl.) The Hebrew name *shoreh* is very similar to the Arabic *shair.* It is the κρίθη of Dioscorides.

Several species of Barley are cultivated. *H. vulgare,* or Spring Barley, having its grains arranged in 4 rows, and *H. hexastichon,* or Winter Barley, having the same in 6 rows, and the officinal species, *H. distichon,* or Common Barley. Spikelets 3 together. Glumes 2, terminating in long awns, with 1 perfect flower, which is distichous, close pressed to the stem, awned, the lateral florets male, awnless, with the upper flower a subulate rudiment placed next the rachis. Paleæ 2, the inferior one ending in an awn. Stamens 3. Ovary hairy at the apex. Segments 2, feathery. Scales 2. Grain oblong internally, with a longitudinal furrow, adherent to the ovary.—Probably a native of Tartary. (Reideul.)

The grains of Barley, deprived of their husks, which, according to Einhoff, amount to 18·75 per cent., form the *Hulled* or *Scotch Barley,* and when ground, *Barley Meal.* When the process of decortication is carried further, and the grains become rounded or ovoid, but still retain the mark of the longitudinal furrow, they form the officinal article, *Pearl Barley.* This ground to powder forms *Patent Barley.* (*p.*) It abounds in Starch, with a little Gluten, Sugar, and Gum. According to the analysis of Einhoff, Barley consists of Meal 70·05, Water 11·20, and of Husk 18·75 in 100 parts, while the Meal consists of 67·18 of Starch, 5·21 of uncrystallised Sugar, 4·62 of Gum, 3·52 of Gluten, 1·15 of Albumen, 6·24 of Phosphate of lime, and

7·29 of Vegetable fibre, the remainder being water and loss. When Barley is malted, Sugar and Dextrine are produced at the expense of the Starch.

DECOCTUM HORDEI, B. Decoction of Barley. *Barley water.*

Prep.—B. Take of *Pearl Barley* ℥ij., *Distilled water* Ojß. Wash the Barley in cold water, and reject the washings; boil with the Distilled Water for twenty minutes in a covered vessel, and strain.

Action. Uses.—Mucilaginous Demulcent, containing the soluble parts of the Barley.

[DECOCTUM HORDEI COMPOSITUM, L. Compound Decoction of Barley, or Barley Mixture.

Prep.—L. Take *Decoction of Barley* Oij., stoned *Raisins*, *Figs* sliced, āā ℥ijß., *fresh Liquorice Root* bruised ℥v., *Aq.* Oj. Boil down to Oij. and strain.

Action. Uses.—Demulcent, and useful as a pleasant diet drink.]

SECALE CEREALE, *Linn.*, or common Rye, is officinal when in a diseased state, forming *Secale cornutum*, Spurred Rye, or Ergot, ERGOTA, B.; but as the properties of this substance seem to depend on the presence of a fungus, it is preferable to treat of it with the Fungi. The Rye cultivated in Europe is considered to be a native of the Caucasico-Caspian Desert; Dr Falconer met with it in Thibet and Toorkistan, where it is called *Deo gundum*, or Devil's Wheat. The meaning of *Kussemeth*, translated Rye and Fitches in our Bible, is uncertain.

TRITICUM VULGARE. Common Wheat.

Wheat is very similar in sound to the Hebrew *khittah*, Arabic *hinteh*, and there is no doubt it was cultivated by and formed the food of the earliest civilised nations. It is the πύροι of the Greeks.

T. vulgare var. *hybernum*, the kind most commonly cultivated, is sown in autumn and reaped in the following summer. Spike four-cornered, imbricated, with a tough articulated rachis. Spikelets solitary, generally 4-flowered. Flowers distichous. Glumes 2, nearly opposite, equal, the upper one bicarinate; the keels more or less aculeate, ciliate, ventricose, ovate, truncate, mucronate, compressed below the apex, round and convex at the back, with a prominent nerve, awned or awnless. Stamens 3. Ovary pyriform, hairy at the apex. Stigmata 2, feathery. Scales 2. Grain loose, externally convex and internally marked with a deep furrow.—Cultivated everywhere; said to be a native of Tartary.

Besides this, *T. vulgare*, var. *æstivum*, or Spring Wheat, is cultivated. *T. compositum*, or Egyptian Wheat, is distinguished by its compound spikes. *T Spelta*, Bere or Spelt, much cultivated in France, and *T. monococcum*, remarkable for having only a single row of grains, may also be mentioned.

The grain of Wheat differs from that of both Barley and Oats in not adhering to its perianth, so that this is easily separated in the process of threshing. It is reduced into Flour, *Farina*, by grinding. The *Bran*, which consists of from 25 to 32 per cent., according to the variety of wheat, is separated by sifting.

The decoction of the wild *Triticum repens* has been lately used as a diuretic remedy in affections of the kidneys and bladder.

FARINA TRITICI, B. Triticum vulgare, *Villars.* Flour. (The grain of wheat, ground and sifted.)

Flour, according to the analysis of Vauquelin, consists of Starch 68·08, Gluten 10·80, Sugar 5·61, Gum 4·11, Water 10·25; but the proportion of these constituents necessarily varies. The ashes of Wheat, which amount only to 0·15 per cent., consist, according to Henry, chiefly of the Biphosphates of Soda, Lime, and Magnesia.

Flour, though officinal, is seldom applied to any medicinal purpose. Its nutritious properties, and its superiority to all other meals for making bread, are well known. Both are dependent on the presence of so large a proportion of *Gluten*, which was at one time thought to be a simple substance, but is now known to be compound (containing *Albumen*, *Vegetable Fibrine*, *Glutine*, and *Caseine*). The Starch and Gluten may easily be separated by kneading Wheat Flour in water, when the particles of Starch are washed out, suspended, and afterwards deposited, in the same way as Sago, Arrowroot, and Tapioca. There remains behind a greyish-white adhesive mass, which is also ductile and elastic. This is Gluten. Its properties are fully described in chemical works. It consists of the 4 substances above mentioned; all of which are compounds of Proteine, and contain Nitrogen. Owing to the presence of this Gluten, the paste made with Wheat Flour is very tenacious, and bread made with it is light, porous, and well raised.

Panis, Bread made from Wheaten Flour, is officinal in the B. P. It is used in making pills, &c. Flour is used in yeast poultice.

AMYLUM, B. Triticum vulgare. Wheat Starch.

Starch may be procured by the above process; but it is obtained on a large scale by steeping the Wheat Flour for some time in water, when Sugar, Gum, and Salts are dissolved, and the liquor becomes sour from the production of Lactic Acid. The Gluten, which adheres to the Starch with great tenacity, is then in a great measure dissolved by the acid, and the starch more easily separated. When the Starch has been separated, it is allowed to drain, and then subjected to pressure. In drying it assumes the form of irregular prisms, so characteristic of manufactured Starch. It has of late been obtained of fine quality from Rice, by the action on it of a weak solution of Caustic Soda. Good Wheat Starch is white, without odour or taste, and appears a soft homogeneous powder. But, when examined under the microscope, it is found to be composed of granules which are unequal in size, each displaying a series of concentric rings, surrounding a central point which has been named the hilum. These Starch granules consist of small cells having a diaphanous wall, which enclose the true Starch, or *Amidine* ($C_{12}\,H_{10}\,O_{10}$). Starch globules are insoluble in cold water, but boiling water bursts the membranous tegument, and then the Amidine is dissolved. If the quantity be sufficient, a gelatinous mass is produced on cooling. If brought when cold into contact with free Iodine, a deep blue colour (*see* p.

45) is produced. This colour is destroyed by heat. Starch is insoluble in Alcohol, also in Ether, as well as in Fixed and Volatile Oils. By the action of Dil. Sul′, Starch is converted into Sugar, and by Nit′ into Oxalic Acid. In the process of germination, and in that of malting, it is likewise converted into Sugar by the action of a principle called Diastase. The composition of Starch, from whatever plant derived, is $C_{12} H_{10} O_{10}$.

The starchy farina, flour, or meal, of many seeds, roots, and other parts of plants, is used for nutritive purposes in various parts of the world. Such a specimen of flour, when examined under the microscope, is seen to consist partly of an amorphous material, and partly of minute grains of starch of a definite shape. The amorphous part consists mainly of gluten, from which the pure fecula is frequently separated artificially, and prepared in the various forms of Starch, Arrowroot, Sago, &c. In many cases these grains of Starch are so peculiar in shape that by a microscopic inspection the source from whence they have been obtained may at once be determined. This subject was first investigated by M. Raspail, but some of his descriptions are inaccurate. He was succeeded by M. Payen, the author of an elaborate and well-illustrated memoir; and a number of very exact descriptions have been since given by Dr Pereira. The following is a brief analytical outline of the microscopic characters of the chief varieties of Starch met with in commerce. Most of these are peculiar, and may be recognised with equal facility, whether the specimen under examination be a pure fecula, or a finely-ground meal or flour, containing also gluten. But the first four Cereal Starches, though easily distinguished from all others, are not so readily recognised individually. Most of the measurements are those of Mr G. Jackson.

A. *Starch-grains more or less circular in shape.*

1. *Of two distinct sizes.*

Wheat Starch. Grains circular; strongly shaded with concentric rings, surrounding a central hilum. Some large, others much smaller, with but few of an intermediate size. Small grains globular, large ones flattened. Size across, from 1 to 9-10,000ths of an inch.

Barley Starch. In barley-meal, &c. Similar to last, but with the grains more irregular in shape; more of the intermediate size; and less shaded with rings.

Oat Starch. In Oatmeal and Groats. Same size as last two; some large and some small; grains much more irregular, being polyhedral by compression; no rings seen at all.

Rye Starch. Grains varying in size in the same way, but growing larger; largest ones measuring as much as 16-10,000ths; with scarce any shading, but peculiar in having a large well-marked stellate hilum in the centre.

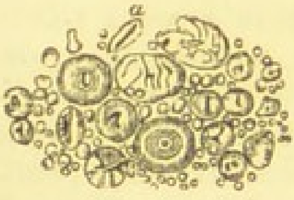

Fig. 101.*

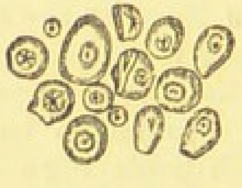

Fig. 102.†

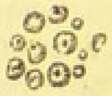

Fig. 103.‡

2. *Nearly uniform in size.*

Tacca Starch. Tahiti Arrowroot is prepared from the tubers of *T. oceanica.*

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* Grains of Wheat Starch; *a*, a particle seen sideways.

† Grains of Tahiti Arrowroot, or Otaheite Salep.

‡ Grains of Portland Arrowroot.

Grains circular, with a central hilum; or mullar-shaped (*i.e.*, abruptly cut off at one end), with the truncate end hollowed out. Average diameter 8-10,000ths.

Maize Starch. In Maize meal, or Polenta. Of an average size, measuring from 5–7-10,000ths of an inch. Irregular, angular, often with projections; and with a marked central hilum, but no rings.

Arum Starch. Portland Arrowroot is made from the root of *Arum maculatum*. Grains very small; diameter 1–4-10,000ths. Usually circular, with a central round depressed hilum.

Rice Starch. Grains still smaller, from 1–2½-10,000ths in diameter. They seem uniformly opaque, and are many-sided—usually hexagonal.

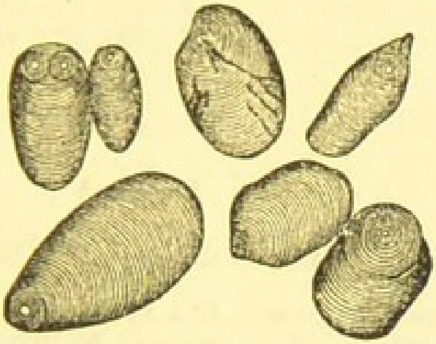

Fig. 104.[*]

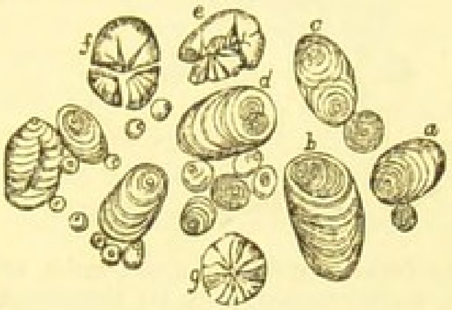

Fig. 105.[†]

B. *Grains more or less oblong or oval.*

1. *Convex and shaded.*

Canna Starch. The fecula called Tous les Mois is obtained in the West Indies from the tubers of *C. coccinea* and *C. edulis*. Grains very large, ovoid, regular in shape; length from 25–40-10,000ths of an inch. Stellate hilum and concentric rings very distinct.

Potato Starch. Sold as English Arrowroot. Grains large and convex; smaller ones circular; larger ones oblong, ovate, or irregular and angular. Hilum near one end, rings well marked; sometimes 2 or more hila, each with a system of rings round it. Length 2–23-10,000ths.

Sago Starch. In Sago-meal and Pearl Sago. Grains large, convex, ovoid, length from 8–20-10,000ths. Some contracted at one end, or mullar-shaped. Hilum near one end; rings distinct. Grains generally more or less broken.

Maranta Starch. West Indian arrowroot is obtained from the tubers of *M. arundinacea*. Grains convex, moderately uniform in size, rather irregular in shape; generally oblong; length 5–20-10,000ths. Rings well-marked; hilum at one end, stellate.

Fig. 106.[‡]

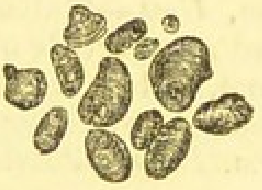

Fig. 107.[§]

Tapioca Starch. In Tapioca (*q. v.*), Brazilian Arrowroot, and Cassava-meal. Grains convex, ovoid, or mullar-shaped, the truncated end often having several facets; concentric rings, and stellate hilum near one end; length 2–10-10,000ths.

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[*] Tous les Mois or Canna Starch.

[†] Potato Starch.

[‡] Grains of Sago Meal.

[§] Grains of West Indian Arrowroot.

2. *Flat and transparent.*

Curcuma Starch. East Indian Arrowroot is yielded by *C. angustifolia*, *C. leucorrhiza*, and other species. Grains peculiar in being flat, transparent, ovate disks, which sometimes show their edges. The narrow extremity, bearing the hilum, often projects like a nipple. Rings very fine. Length 12–24-10,000ths.

Plantain Starch. (See below.) Prepared in Guiana from the unripe fruit of *Musa paradisiaca.* The grains are described as flat and transparent, like Curcuma starch, and ovoid, with the hilum at the narrow end.

Fig. 108.*

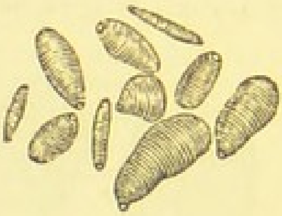

Fig. 109.†

The following farinæ and feculæ, sent from India to the Great Exhibition of 1851, were examined by Dr Headland.

Plantain Meal, from Madras. Grains transparent, like those of Curcuma Starch, but not so thin. They vary in length from 3 to about 30-10,000ths of an inch. Often irregular in shape, but generally oval, some being long, narrow, curved, and cucumber-like, by which this starch may be readily distinguished. The rings are fine, but very distinct; the hilum small.

Phœnix Sago Meal, from Cuttack. Probably from the trunk of some species of *Phœnix.* Grains large and solid; shape circular, pyriform, or oval; hilum very marked, placed near the centre, sometimes linear, but usually stellate, cracked and fissured. Length about 15–20-10,000ths.

Trapa Starch. From seeds of *Trapa bispinosa*, Bengal. Grains oval or triangular in shape; often irregular and tuberculate, like Maranta Starch; having a central hilum. Length about 10-10,000ths.

Unknown fecula from Rutnagherry (Bombay). Grains small, solid, mostly circular, some few mullar-shaped, with a depressed hilum in the centre. Average diameter 4-10,000ths. Very similar to Arum Starch, and possibly derived from some Aroideous plant.

Nelumbium Starch. From seed of *Nelumbium speciosum*, Cuttack. Grains very small, tolerably uniform in size, and oval in shape. Length from 1–3-10,000ths.

Specimens of *Arrowroot* (one of them, from Rutnagherry, stated to be the produce of the *Kutchoora* plant) and of the Starch of *Curcuma leucorrhiza*, from Bengal, had both of them the characters of Curcuma Starch, as given above.

Action. Uses.—Starch is Nutritious and Demulcent, extensively employed as an article of diet, and for the sick, in the form of Sago, Arrowroot, and Tapioca. As hair-powder, or "violet-powder," it is employed for powdering the irritated skin.

Pharm. Prep.—Pulvis Tragacanthæ Comp.

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* Entire grains of Tapioca.

† Grains of East Indian Arrowroot. These drawings, which are all made to one scale, are copied from those in Dr Pereira's Treatise on Food and Diet. They represent with tolerable accuracy the microscopic appearance of some of the Starches described; though the grains of Curcuma Starch are somewhat flatter than is here shown, and should be less strongly shaded. For accounts of the structure and formation of the starch-grain, *see* Payen's Memoir in the *Annales des Sciences Nat.*, vol. x., a paper by Mr Busk in the *Microscopical Journal*—also *Pharm. Journ.* xiv. 253, 446.

MUCILAGO AMYLI, B. Mucilage of Starch.

Prep.—B. Take of *Starch*, gr. cxx.; *Distilled water*, f℥x. Triturate the Starch with the water, gradually added, then boil for a few minutes, constantly stirring.

Action. Uses.—Demulcent. Useful in Dysenteric and Urinary Complaints as an injection; and also for suspending powders.

GLYCERINUM AMYLI, B. Glycerine of Starch. Plasma.

Prep.—Take of *Starch*, ℥j.; *Glycerine*, f℥viij. Rub them together until they are intimately mixed, then transfer the mixture to a porcelain dish, and apply a heat gradually raised to 240°, stirring it constantly until the starch particles are completely broken and a translucent jelly is formed.

Action. Uses.—Intended to replace Fats as a basis of Ointments, preferred by some as not being liable to rancidity. A similar preparation has been long sold in the shops as *Plasma* and *Glycerine Jelly*. It forms a good emollient application to eruptions, chaps, chilblains, and excoriated surfaces.

Other Grasses abound in Fecula and afford nutritious diet. Rice, *Oryza sativa*, contains at least 89 per cent. of Starch (Payen), about 7 Gluten, and a little Gum, Sugar, Oil, Water, Lignine, and Phosphate of Lime. It forms a good substitute for Potatoes, &c.; if carefully boiled and steamed, the grains remain soft and separate, instead of forming a pulpy mass. Maize or Indian Corn, *Zea Mays*, which, like rice, forms the chief food of millions, and is highly esteemed by the Americans, is nutritious, containing Starch 67 per cent., Gluten 12, a little Sugar, Gum, Oil, and Salts. The flour is sold by the name Polenta, and corn-flour. Coarsely ground it makes excellent Gruel, and may be used for poultices. *Sorghum vulgare*, the *joar* of India, *durra* of the Arabs, is well suited to the same purposes, as are also many of the smaller grains, especially of the tribe *Paniceæ*.

Tribe *Saccharineæ*.

SACCHARUM PURIFICATUM, B. Saccharum officinarum, *Linn.* Refined Sugar. White Sugar.
THERIACA, B. Sacchari Fæx. Treacle.

Sugar is a principle very generally diffused in the vegetable kingdom. In the East and West Indies it is obtained chiefly from the Sugar Cane, but in the East also from Palms; in France, from the Beet Root and Mangel-Wurzel; in America, from the Maple; and it is also found in many fruits, roots, &c. It is probable that it was first discovered by evaporating the juice of Palms in India, of which the Sugar is called *jaggarg*. But the Sugar of the Cane has been known both in India and Egypt from very early times, and the ancients were acquainted with it. (*See* Essay on the Antiq. of Hindoo Med. p. 83.)

The Sugar Cane grows from 6 to 12 feet high, with a jointed stem, hard and dense externally, but juicy in the inside. Leaves long, linear, strap-shaped, enveloping the stem with their sheaths. Panicles 1 to 3 feet long, elegantly diffuse and waving, silvery from the quantity of long hairs attached to each floret. Spikelets all fertile, in pairs, the one sessile, the other stalked, articulated at the base, 2-flowered, the lower floret neuter, with one palea, the upper hermaphrodite, with 2 paleæ. Glumes 2, membranous, obscurely 1-nerved, with very long hairs on the back. Paleæ transparent, awnless, those of the hermaphrodite flowers minute, unequal. Stamens 3. Ovary smooth. Styles 2, long. Stigmas feathered. Scales 2, obscurely 2 or 3-lobed at the point, distinct. Grain little known. A native probably of India, the Indian Islands, or of China.—Nees von E. 33, 34, 35; St. and Ch. 148.

The Sugar Cane is cultivated from cuttings, and takes about a year to come to maturity. It is then cut down close to the earth, topped, stripped of its leaves, and crushed between iron rollers, or in a wooden mill. The juice is first mixed with Lime to saturate the acid which is present, and then heated. The clear liquor is separated and evaporated till it becomes granular. It is then put into casks, the uncrystallisable parts (the *Molasses* or *Treacle*) allowed to drain off, and the Sugar left in the state of the Raw or Muscovado Sugar of commerce. The quantity of Treacle is diminished, and that of the Sugar increased, by employing a less degree of heat and by boiling *in vacuo.* It undergoes purification in various ways, by solution in water, refining with albuminous matter, filtration through a stratum of animal charcoal, evaporation, and recrystallisation, and by passing pure syrup through it. When white and pure, it forms refined or loaf Sugar, and is usually met with in compact conical masses, with a crystalline fracture.

Cane Sugar ($C_{12}H_{11}O_{11}$), allowed to crystallise slowly from its solution, forms large crystals of hydrated Sugar, or Sugar Candy, in oblique rhombic prisms. Sugar is well known for its pure and sweet taste. Sp. Gr. 1·6. It is white, and without odour, soluble in water, forming Syrup, less freely so in Alcohol. It is unchanged in the air, but when heated melts, and again solidifies on cooling in the form of glassy clear *Barley Sugar.* When heated to a greater degree, it becomes decomposed, swells, emits a peculiar odour, becomes of a deep-brown colour, and is called Burnt Sugar, or *Caramel*, which is much used for colouring Spirits. It burns away at a higher heat. Sugar combines with the alkalies; and after a time the alkaline reaction disappears, and an acid (the Glucic) is formed. It also unites with some metallic oxides, as that of Lead. When pure no precipitate takes place with Diacetate of Lead. It prevents both the Iodide and Carbonate of Iron from being readily decomposed, and it renders the fixed and volatile oils to a certain extent miscible with water. Nit′ converts it into Oxalic acid. Sul′ chars it; but when long boiled with diluted Sul′ it is converted into Grape Sugar. A weak watery solution exposed with yeast to a temperature between 50° and 80°, undergoes fermentation.

Grape Sugar ($C_{12}H_{12}O_{12}+2\,HO$, when crystallised), Sugar of Fruits, or *Glucose*, is found in the Grape and in other fruits, and differs in several particulars from Cane Sugar, besides, in containing more Oxygen and Hydrogen. It is less sweet, less soluble in water, crystallises in warty granular masses, and combines with difficulty with Lime, Baryta, and Oxide of Lead. Its solution becomes brown when heated with caustic Potash, which does not colour Cane Sugar. It dissolves in Sulph. acid without blackening.

Action. Uses.—Dietetic, Nutrient, Demulcent. Sugar is much used to cover the taste of medicines; also in Syrups, Conserves, Confections, Electuaries, and Lozenges; and to suspend oils in aqueous liquids. Treacle, remaining soft, is well adapted for making pills.

SYRUPUS, B. Syrup.

Prep.—B. Take of *Refined Sugar*, ℔v.; *Distilled water*, Oij. Dissolve the Sugar in the Water with the aid of heat; and add, after cooling, as much Distilled water as may be necessary to make the weight of the product seven pounds and a half. The specific gravity should be 1·330.

Action. Uses.—Syrup is applied to all the pharmaceutical uses of Sugar. It is preserved at a temperature of 50°. It sometimes requires to be purified by boiling with the white of egg.

The *Cyperaceæ* may be called the grasses of moist situations, and they very closely resemble them in appearance; but they may readily be distinguished by their stems being solid, often triangular, and their leaves with entire, not split sheaths. They are much less useful than the plants of that family. The famed Papyrus belongs to the Cyperaceæ. A few secrete fecula in their tuberous rootstocks, as the Water Chesnut of the Chinese; others secrete a little Volatile Oil, as *Cyperus longus* and *rotundus*. The creeping rhizomas of *Carex arenaria*, and of a few allied species, are sometimes used medicinally, under the name of German Sarsaparilla.

Class III. ACOTYLEDONES, *vel* CRYPTOGAMÆ.

Sub-Class I. ACROGENÆ.

FILICES, *Juss.* Ferns.

The rhizomes of many Ferns are astringent, some contain a volatile oil, and some an acrid principle. The fronds are mucilaginous when young, and are used as food in some countries.

FILIX MAS, B. Aspidium Filix Mas, *Swartz.* The Rhizome, dried, collected in summer. (Indigenous.) Male Fern. *Fern root.*

This is supposed to have been the πτέρες of Dioscorides. Several Ferns were no doubt employed medicinally by the ancients.

The Rhizoma horizontal, thick, with numerous tufts (the bases of the fronds) ranged along the common axis, separated from one another by brownish-yellow silky scales. The true roots emerge from between these tubercles, and descend downwards. The fronds or leaves ascend upwards in tufts 1 to 4 feet high. Fronds bipinnate, rising in a circle from the tufted rhizoma; pinnules obtuse and serrated, only slightly narrowed downwards, and the lowest leaflet of considerable size, lobes usually a little combined at the base. Veins distinct, after leaving the midrib, not uniting with those of the adjoining pinnule. Stripes, or footstalk and midrib, either glabrous, yellow, or densely clothed with purple scales. Sori roundish, scattered, covered by an indusium, which is reniform, attached by the sinus. Sori placed in two rows near the central nerve, and below its lower half.—Indigenous in woods, but found in other parts of Europe, &c.—Nees von E. 27.

The parts officinal in the B. P. are "the dried rhizome, with the bases of the footstalks, and portions of the root fibres."

The Rhizoma, according to M. Peschier, of Geneva, should be collected in summer. M. Geiger directs that the inner parts of the fresh root-stock, and of the portions of leaf-stalk attached to it, which are fleshy and of a light-greenish colour, should alone be preserved; the black and discoloured parts with the fibres and scales should be separated, and the other parts carefully dried, powdered, kept in small well-stopped bottles, and renewed annually. The powder should be of a light-greenish colour, of rather a disagreeable odour, a bitter and astringent taste. Analysed by Geiger, it was found to contain a Fatty Oil 6·9, Resin 4·1, with Tannin, Starch, Gum, and Uncrystallisable Sugar. Morin, of Rouen, discovered a Volatile Oil. M. Peschier, of Geneva, found its active principle to be soluble in Ether.

EXTRACTUM FILICIS LIQUIDUM, B. Liquid Extract of Fern Root.

Prep.—Take of *Male Fern*, in coarse powder, ℔ij.; *Ether*, Oiv., or a sufficiency. Pack the Male Fern closely in a percolator, and pass the Ether slowly through it, until it passes colourless. Let the Ether evaporate on a water bath, or recover it by distillation, and preserve the oily extract.

This is the authorised formula for the preparation which is largely used as "Ethereal Extract" or "Ethereal Oil" of Male Fern. It is very efficient in doses of ♏xv.–♏xxx.

Action. Uses.—Anthelmintic: has been so used from early times; formed the basis of Madame Nouffer's remedy for expelling tapeworms. Dr Peschier, a brother of the above, Brera, and Ebers, have borne testimony to its efficacy, in the form of the Ethereal Extract, of which they gave from 12 to 24 gr. (at night and again in the morning), or from 1 to 3 drachms of the powder. A decoction (℥j. to Aq. Oj.) has also been employed in divided doses. A dose of Castor Oil is exhibited after the second dose of the Ethereal Extract in cases of Tape-worm, it being found most useful for that kind which is more common on the Continent, the *Bothriocephalus latus.*

The rhizoma of the *Aspidium Athamanticum*, Kunze, which grows near Port Natal, is stated by Dr Pappe to be in high esteem among the Zoolu Caffres as a vermifuge, especially for Tapeworm. It is called *Uncomocomo.*

The silky hairs from the stipe of one or more species of *Cibotium* have been imported from Sumatra under the name of *Penghawar*, and from the Sandwich Islands as *Pulu.* They have been used as a styptic in Holland, and imported into this country.

Sub-Class II. THALLOGENÆ.

LICHENES, *Juss.* Lichens.

They crawl upon the earth, or on rocks, or on the bark of trees, sometimes burrowing into their substance. Some are mucilaginous and nutritious, others bitter and astringent, and a few remarkable for yielding colouring matter.

CETRARIA, B. Cetraria Islandica, *Achar.* (*Lichen islandicus*, Linn.) Iceland Moss. *Iceland Lichen.*

This Lichen was first employed by the natives of Iceland.

Plant erect, 2 to 4 inches high, formed of a dry, leathery, smooth, laciniated, foliaceous thallus, the lobes of which are irregularly subdivided, channelled, and fringed at their edges. Those divisions upon which the reproductive matter is produced are more dilated, smooth, of a light-brownish colour, paler on the under surface, rather reddish towards the base. The fructifications or *apothecia* are shield-like, or like shallow saucers, with a harder elevated rim, of a deeper brown colour, and project from the surface of the thallus near its border. Mountains of both the Old and New World.—Nees von E. 10; St. and Ch. 69.

This Lichen, in its dried state, varies in colour from greyish-white to reddish-brown, is without smell, but has a mucilaginous bitter taste. When moist, it is a little leathery, but when dry may be powdered. Cold water takes up only a small portion, but boiling water about 65 per cent. of its substance, forming a slimy and nearly colourless liquid, which, if the decoction be strong, forms a jelly on cooling. Alcohol dissolves the bitter principle, which is an acid called *Cetraric'*, almost insoluble in water, slightly soluble in alcohol and ether. It has been obtained in white crystals, which are extremely bitter, and have been used as a substitute for Cinchona. Alkalies readily combine with it, and form soluble compounds; and this affords the best method of freeing this and other similar Lichens from their bitter principle; as by macerating them in 24 times their weight of a solution formed of 1 part of an alkaline carbonate and 375 parts of water. The inhabitants of Iceland and Lapland, however, free it of the bitter principle by repeated maceration, and then make use of it as an article of diet, either made into bread, or boiled with milk. They find it nutritious, from the principle called *Lichenin*, or Lichen-Starch. This does not dissolve, but swells up in cold water; the solution is not affected, although its jelly is rendered blue by Iodine. It may be converted into Grape-Sugar by dil. Sul', and most nearly resembles the jelly of the sea-weeds. Iceland moss also contains *Inuline*, another starch-like body. These two starchy matters form about 80 per cent., and the Cetraric acid 3 per cent.

DECOCTUM CETRARIÆ, B. Decoction of Iceland Moss.

Prep.—B. Take of *Iceland Moss* ℥j., *Distilled water* Oj. Wash the Moss in cold water to remove impurities; boil it with the Distilled water for ten minutes in a covered vessel, and strain while hot. Pour water over the contents of the strainer till the product measures a pint.

Action. Uses.—Demulcent: Tonic; for cases where more stimulant remedies are unsuitable, as Phthisis and other chronic Pulmonary affections, in doses of f℥jß–f℥iij. every three or four hours.

LITMUS (B. Appendix). A Blue Pigment from Roccella tinctoria, *Achar*, and other species. Dyers' Orchil or Weed.

Orchil (written also Archil) is the name of a dye, as well as of the plant yielding it. But several distinct plants are employed for the same purpose, distinguished by different names according to the country from whence they are imported. They are divided by manufacturers into *weed* and *moss*, the former term being applied to the filiform Lichens of botanists, belonging to the genus *Roccella*, while the term *Moss* and *Rock Moss* is applied to the crustaceous Lichens belonging to the genus *Lecanora* and others like it.

The most valuable of these dye-lichens is imported from the Canaries, and consists of *Roccella tinctoria;* but some *R. fuciformis* is also imported under the name of Madeira Weed. It is doubtful, however, whether either of these is always employed in the preparation of *Litmus*, as this is said to be prepared from *Lecanora Parella* and *tartarea;* the first called by the French *Parelle d'Auvergne*, the latter the *Cudbear* of English commerce. Guibourt states that the colour of Litmus is given by *Crozophora tinctoria*, or Turnsole, one of the Euphorbiaceæ. Dr Pereira has proved that the Litmus of commerce always contains Indigo. The blue colour, however, is formed out of the lichens themselves, a red colouring matter being first developed by the action of ammoniacal salts (as from putrid animal matters), and this being changed into a blue by the addition of Potash or Soda. Dr Müller (P. J. xii. 255) states that all kinds of lichens are used in the production of Litmus; that the best qualities made in Holland are prepared from *Roccella tinctoria;* but inferior sorts from species of *Variolaria*, *Lecanora*, and *Parmelia*. These are ground, and placed in contact with nitrogenous matters, as urine, at a certain heat. A red colouring matter forms first. Potash is then added, and powdered Carrara marble mixed in.

Uses.—Litmus is officinal only as a test for ascertaining the presence or excess of acids and alkalies; blue Litmus paper being changed to a red by acids, and reddened Litmus having its colour restored by alkalies.

The B. P. prepares a Tincture from 1 oz. of Litmus and 10 oz. of proof Spirit. Unsized paper steeped in this, and dried by exposure, forms Blue Litmus paper, a test for acids. The Red Litmus paper, a test for alkalies, is made with the Tincture which has first been reddened by the addition of a very minute quantity of Sulphuric acid.

ALGÆ, *Juss.* Sea-Weeds.

Many Algæ abound in gelatinous matter, as the Ceylon Moss prepared by Mr Previté, respecting which several favourable testimonies have been given, and which is stated to contain from 54 to 63 per cent. of jelly. This appears to be, as stated by Dr Lindley, a species of *Gracillaria*, as the edible Birds' nests are composed of one collected by swallows. A *Gelidia* from Ceylon is noted in Rottler's Herbarium as yielding jelly; and *Chondrus crispus*, or the Carrageen Moss of Ireland, has been introduced as a Nutrient and Demulcent, and used both in the form of Decoction and of Jelly. *Gigartina Helminthocorton*, or Corsican Moss, is officinal on the Continent as an Anthelmintic. It probably acts, like Cowhage, as a mechanical irritant, from the fragments of numerous corallines mixed with it. (*See* Fee and Merat and De Lens.) Some species of *Porphyra* and *Ulva* yield the Laver, which is used as an article of diet, as Laminaria is in Lapland. Some Sea-weeds are employed as manure for land. Some are burnt for Kelp (*see* p. 105), or impure Carbonate of Soda, which is now chiefly valuable on account of the Iodine it yields (*see* p. 45), on which account seemingly a Laminaria, from the China or Caspian Seas, or from the Persian Gulf, finds its way to the foot of the Himalayas, where it is employed as a cure for Goître. (*See* p. 46.)

The ashes of the *Fucus vesiculosus*, or common Bladder-wrack, form a popular cure for Goître on the sea-coast of England. They contain Iodine.

FUNGI, *Juss.* Mushrooms.

Fungi generally abound in moist situations, are generated on leaves and stems, are sometimes subterranean, but are most frequently found on organised bodies in a state of decomposition. A few of them are edible, as the common Mushroom (*Agaricus campestris*), and Truffle (*Tuber cibarium*), but all are suspicious. *Ammanita muscaria* is remarkable for its intoxicating properties; many are poisonous. The Agarics of the old Materia Medica are now referred to the genus *Polyporus;* and *Amadou*, used as tinder, is made from *P. igniarius*. They are remarkable among plants for consuming much Oxygen, and giving out Hydrogen and Carbonic acid gas. Analysed by Vauquelin and Braconnot, they have been found to contain some peculiar principles, as Fungin and Boletic and Fungic acids. They are very destructive to plants and property in the forms of Mildew, &c., and of Dry Rot, and of late, if not caused, they have at least greatly accelerated the ravages in the Potato crops and vineyards of Europe.

ERGOTA, B. The *Sclerotium* (compact *mycelium*, or spawn) of Claviceps purpurea, *Tulasne*, produced within the paleæ of Secale cereale, *Linn.* Common Rye. The grain of Rye diseased by the presence of an imperfect fungus. Ergot.

Ergot seems to have been first used as a medicine by the profession in France and the United States towards the end of the 18th and the beginning of the present century, but in this country not before the year 1824. Its effects seem to have been long popularly known in Germany, and pestilential diseases in early times have been ascribed to eating ergotised grain as food. (*See* Burnett's Outlines of Botany, p. 207.) Various opinions have been entertained respecting the nature of Ergot, some considering the whole Ergot as a Fungus, which has been named *Spermoedia Clavus* by Fries, and is supposed to take the place of the natural grain. Others consider that the grain of Rye is simply diseased, from ordinary causes. But the opinion which appears the most satisfactory, is that which considers the Ergot as the grain of Rye stimulated into diseased action by the presence of the spores or sporidia of a parasitical Fungus. This opinion, promulgated by Leveillé (*see* Merat and De Lens), has been fully confirmed by others, especially by Mr Edwin Quekett, who has shown that the Ergot is the altered grain, from its articulation to the receptacle, the scales at its base, the hairy crown of the grain, and frequent remains of the stigma on its top. Some beautiful drawings, now in the British Museum, have been made of it in its different states by Mr Bauer (*see* Trans. Linn. Soc. vol. xviii., and the Penny Magazine, where some of them have been published). The first appearance of the Fungus, which Mr Quekett named *Ergotætia abortifaciens*, is indicated by the young grain and its appendages becoming covered with a white coating, which is formed by a multitude of sporidia mixed with cobweb-like filaments. A sweet fluid, which by degrees becomes viscid, and is found to contain the sporidia, oozes from the Ergot or parts around it. When half-grown, it shows itself above the floral envelopes, and is of a dark purplish colour; the production of sporidia then nearly ceases, and the upper part of the grain is observed to be of an undulated vermiform appearance, which Leveillé considers to be the single Fungus, and calls *Sphacelia segetum*, but which, as ascertained by Mr Quekett, consists of myriads of sporidia. The Ergot, come to its full size, is of a violet-black colour, and projects much above the paleæ. Many other Grasses and some Cyperaceæ are liable to be affected by Ergot, which is most prevalent in damp situations and in moist seasons. (*See* Linn. Trans. vol. xviii. t. 32, 33.)

The Sporidia are described by Mr Quekett as elliptical, moniliform, finally separating, transparent, and containing seldom more than one, two, or three well-defined (greenish) granules.

(The fungus has been described by Tulasne as *Claviceps purpurea*, a name which has been adopted in the B. P. 1867.)

The Ergot of Rye is sometimes called Spurred Rye (*Secale cornutum*) from its elongated and curved form, resembling the spur of a cock. It is either cylindrical or somewhat angular, tapering towards both extremities, from half, to an inch and a half in length, and two or three lines in diameter, with two furrows along its length, often terminated at the apex by a greyish projection. It is on the outside of a purplish colour, internally of a greyish-white with a tinge of red. The smell is peculiar, nauseous, and musty; the taste is slight, bitterish, a little acrid. Ergot is brittle, easily pulverised when dry. The surface, where glaucous, is found to be composed of sporidia; and the interior of the cellular tissue has the characters of the natural Albumen of the grain, within which are globules of oil, according to Mr Quekett.

Most of the Ergot used is imported from the Continent and from America, and requires to be renewed every year or two, as it is apt to be destroyed by an Acarus, which produces much excrementitious matter.

Various analyses have been made of Ergot. Wiggers found in 100 parts a *Fixed Oil* 35·00, Fungin 46, a peculiar principle called *Ergotine* 1·25, which has a heavy odour and a disagreeable acrid taste, and was supposed to possess all the active properties of the drug; besides these, a little Phosphoric acid combined with Lime, Potash, and Iron, a little Gum, Sugar, Albumen, Vegetable Osmazome, and Wax.

The name *Ergotine* has been applied to an aqueous extract of Ergot of Rye, but the true *Ergotine*, as discovered by Wiggers, exists only in the proportion of about 6 gr. in the ounce. It is said to be narcotic. It is soluble in spirit, and not in water; whence it is argued by Ingenhohl that it cannot be the principle which promotes the contraction of the uterus, for aqueous infusions and decoctions of Ergot are often prescribed with advantage for this purpose.

Dr Wight stated that the activity of the drug resides in the *Fixed Oil*, which may be separated from its powder by Ether, and this afterwards evaporated. Ether does not dissolve the *Ergotine.* And yet again Dr Bertrand found that this fixed oil had no action on man or animals, and Kilian of Bonn employed Ergot, which had been freed from oil by ether, with the best effect.

The latest examination of Ergot has been made by Winckler. He separated from it by means of Ether 34·4 per cent. of a fixed oil, which is destitute of medicinal power. In the residue there still existed two principles,—*Secalia*, a volatile basic substance, analogous to Propylamine, and having a disagreeable odour—and the *Ergotine* of Wiggers, which seems to possess acid properties, and is combined with the other to form an *Ergotate of Secalia.* It is this compound in which the medicinal activity probably resides; it is soluble both in alcohol and water, but not in Ether (?) The colouring matter of Ergot was found to resemble the red *Hœmatine* of blood.

The active properties of Ergot are apparently extracted by boiling water, alcohol, and ether. (None of the supposed active principles are soluble in all of these menstrua.)

Action. Uses.—The effects of Ergot were first observed in the diseases produced by it when taken for some time with the ordinary food, that is, in Convulsive Ergotism and in Gangrenous Ergotism, both accompanied with Formication. In single doses of gr. cxx., Dr Wright and others have observed that it created nausea, vomiting, colic pains, and headache, sometimes stupor and delirium. In many cases it has also been observed to depress the pulse. Given to women when in labour, Ergot has been found so constantly to excite the labour pains and to cause the speedy expulsion of the child, that it has now become established as a safe and effectual remedy in cases where slowness of labour is dependent only on insufficiency of uterine contraction. It may be prescribed also for expelling the placenta, clots of blood, or hydatids; or to produce contraction, and restrain hæmorrhage. It has also been prescribed as an Emmenagogue, and as a general astringent.

Dose.—Gr. xx.-gr. xxx. in fine powder, or with Syrup and some aromatic, repeated, if necessary, at intervals of 15 or 30 minutes, for two or three times. Dr Wright recommended the Oil of Ergot, obtained by evaporating the Ethereal Tincture, which he found to produce uterine contractions in doses of ♏xx.-♏l., which may be given in any convenient vehicle. Its utility is doubtful, and altogether denied by many. The following preparations of Ergot are employed.

INFUSUM ERGOTÆ, B. Infusion of Ergot.

Prep.—Infuse coarsely-powdered *Ergot* ℥¼ in *boiling Dist. water* f℥x. for half an hour in a covered vessel, and strain.

Dose.—f℥ß–f℥ij. Probably contains Ergotine in combination, or the above *Ergotate of Secalia* of Winckler.

EXTRACTUM ERGOTÆ LIQUIDUM, B. Liquid Extract of Ergot.

Prep.—B. Take of *Ergot*, in coarse powder, ℔j.; *Ether*, Oj.; *Distilled water*, Oiijß; *Rectified Spirit*, f℥viij. Shake the Ether in a bottle with half a pint of the Water, and after separation decant the ether. Place the Ergot in a percolator, and free it from its oil by passing the washed ether through it. Remove the marc, and digest it in three pints of the water at 160° for twelve hours. Press out, strain, and evaporate the liquor, by the heat of a water bath, to nine fluid ounces; and, when cold, add the spirit. Allow it to stand for an hour to coagulate, then filter. The product should measure sixteen fluid ounces.

This liquid extract, introduced into the B. P., does not contain the principle of Ergot soluble in Ether (Oil), but only that soluble in water (Ergotine). It is thus free from the objections which attach to the ethereal tincture (*see* below), which only contains the former, which is now pronounced by some writers to be inert, by others poisonous.

Dose.—♏x.–♏xxx.

TINCTURA ERGOTÆ, B. Spirituous Tincture of Ergot.

Prep.—*Ergot*, bruised, ℥v. in *Proof Spirit* Oj. Prep. as Tinct. Aconiti.

Dose.—♏x.–ʒj. Contains Ergotine and Secalia.

[TINCTURA ERGOTÆ ÆTHEREA, L. Ethereal Tincture of Ergot.

Prep.—Macerate for seven days bruised *Ergot* ℥xv. in *Ether* Oij. Press and strain.

Introduced in 1851. First used by Dr Lever. If really it be of use, it is difficult to account for its power. According to Winckler and others, it contains none of the medicinal principles of Ergot, but only the fixed oil, which they allege to be quite inoperative.

Dose.—fʒß–fʒij.]

PRODUCTS OF FERMENTATION.

Organic substances are occasionally liable to undergo spontaneous decomposition, and to form new compounds, from the affinity which exists between their constituents. Some are very permanent in nature, as the vegetable acids and alkalies, also the resins; but others are ready to undergo a transposition of their elements when under the influence of an external agent, or, in other words, prone to pass into a state of fermentation. These substances belong to that group of organic products which contain Carbon along with Hydrogen and

Oxygen in the proportion in which these two exist in water,—such as Starch, Sugar, and Mucilaginous substances; while the *ferments* belong to the *Albuminous* group, or such as contain much Nitrogen in their composition, as Gluten. The conversion of Starch or Fecula into Sugar, as exemplified in the ripening of fruit, or in the process of germination, and seen on a great scale in the operation of malting, is by some called *Saccharine fermentation.* But the term of Fermentation is more expressly applied to the production of Alcohol and Carbonic' gas at the expense of Sugar, as seen in *Vinous fermentation*, and to the further change which, under peculiar circumstances, takes place of Alcohol into Vinegar, called *Acetous fermentation.*

ALCOHOL (B. Appendix). Sp. Gr. ·795.

SPIRITUS RECTIFICATUS, B. *Alcohol dilutum.* Rectified Spirit. Sp. Gr. ·838. (84 per cent.)

SPIRITUS TENUIOR, B. *Alcohol magis dilutum.* Proof Spirit. Sp. Gr. ·920. (49 per cent.)

The process of distillation has been long familiar to the natives of India, as exemplified in their several *araks* or Spirits, and their Rose-water and *attar* of Roses. From them it was no doubt made known to the Arabs.

When Sugar is dissolved in water, and some ferment, such as *yeast*, is added, in a temperature of between 60° and 80°, brisk motion is observed to take place, the liquid becomes turbid, froth collects upon its surface, Carbonic acid gas is copiously evolved, the impurities finally subside, and the liquid becomes clear. The Sugar has disappeared, and Alcohol, which has been produced, may be separated by distillation. The Sugar which has disappeared is equivalent to the united weight of the Alcohol and Carbonic acid gas which have been produced; but when Cane Sugar undergoes fermentation, one atom of water is first united with it, that it may be converted into Grape Sugar. Gay-Lussac calculated that 90·72 parts of Sugar are capable of supplying 46·68 parts of Alcohol, and 44·24 of Carb' gas, making together 90·72, or an equal weight. Alcohol is composed of $C_4 H_6 O_2$, and an equivalent of Grape Sugar, $C_{12} H_{12} O_{12}$, will break up into 2 equiv. of Alcohol, and 4 of Carb. acid.

Spirit, however, is obtained from Cane Sugar in the East and West Indies in the form of Rum. On the Continent it is obtained chiefly from the juice of the Grape, which contains all the elements for due fermentation. Spirit may also be distilled from feculent roots, as Potatoes; or from grain, as Rice in India, or malted Barley, as in this country. In these latter cases the Fecula or Starch has first to be converted into Grape Sugar, before the vinous fermentation takes place. The Spirit first obtained is comparatively weak, being mixed with some water and a trace of Essential Oil, which is known by the name of *Grain Oil.* In this state it is usually called *Raw Spirit.* By a second distillation it is freed from much of this water and Oil, and may be procured of the Sp. Gr. of ·835, which is the strongest *Rectified Spirit*, or *Spirit of Wine* of commerce, but which still contains about 13 or 14 per cent. of water. This is rather above the standard of the officinal Rectified Spirit.

Pure Spirit, or *absolute alcohol*, may be obtained by distilling Oj. of Rect. Spirit and ℥jß of Carb. Potash (B. P.) with half its weight of lime slaked. Its specific gravity is ·795. Its composition is $C_4 H_6 O_2$—or *theoretically*, $C_4 H_5 O, H O$, as it is considered to be a hydrated oxide of the radical *Ethyle* ($C_4 H_5$).

Spiritus Rectificatus.—Colourless, transparent, very mobile and inflammable, of a peculiar, pleasant odour, and a strong spirituous burning taste. Burns with a blue flame without smoke. Specific gravity 0·838. Remains clear when diluted with distilled water. Odour and taste purely alcoholic. *Four fluid ounces with thirty grain measures of the volumetric solution of Nitrate of Silver exposed for twenty-four hours to bright light, and then decanted from the black powder which has formed, undergo no further change when again exposed to light with more of the test.* (B.)

This black powder is derived from the decomposition of the Salt of Silver, by means of the small quantity of Grain Oil which Rectified Spirit still contains, and from which it is with difficulty freed. Its presence may also be detected by the reddening with an equal vol. of pure Sul′. The properties of Rectified Spirit are essentially the same as those of Alcohol; it is an excellent solvent for many of the officinal Resins, some of which it dissolves more than Alcohol. Rectified Spirit still contains water to the extent of $\frac{1}{10}$ or $\frac{1}{11}$, or 18 water to 82 Alcohol in 100 parts. A stronger Spirit is required for some purposes, especially for testing.

If the Sp. Gr. is higher than ·838, it must be again rectified to reduce it to that point.

Alcohol is officinal as a test (B. Appendix). It contains no water. The B. P. prepares it by distilling Rect. Spirit (Oj.) with Lime and Carb. Potash as mentioned above. The Lime and Potash entirely abstract the water, and remain in the retort with it until all the spirit has been distilled over. 17 oz. of Alcohol may thus be separated from Oj. of Rect. Spirit.

A strong spirit ·818 may be obtained by shaking dry Carb. Potash ℥viij. with Cß of Rect. Sp. in a bottle for four hours at a temperature of 100°. The liquid separates into 2 strata; below is a solution of Carb. Pot. in water; above, is a layer of Spirit, measuring about ℥lxxiv. To purify this, ℥lxxij. are distilled off. This Spirit is intermediate in strength between Alcohol and Rectified Spirit. It consists per cent. of 90 parts of Alcohol and 10 of water. Chloride of Calcium used to be employed by the L. C. for the preparation of Alcohol, as it has a very great affinity for water. But it differs from Carb. Potash in being soluble in Alcohol; the latter must therefore be distilled off it.

The Alcohol of the Excise regulations has a Sp. Gr. of ·825. Alcohol, when pure, is light, limpid, and colourless, of a peculiar, rather agreeable odour, and a warm, burning taste. It is very volatile, and produces considerable cold during its evaporation. Its boiling point is from 173° to 175°, when Sp. Gr. is ·820 at 60°. The stronger the Alcohol, the lower is the boiling point. Sp. Gr. of its vapour 1·613. It burns readily, without smoke, water and Carb′

being produced. It has never been frozen, and is hence well adapted for making thermometers for ascertaining cold. It unites with water in all proportions, some condensation and evolution of heat taking place. It is a powerful solvent of many substances, as the Vegeto-Alkalies and the Fixed Alkalies (but not their carbonates), many crystalline neutral Resins, Volatile and Fixed Oils; also some elementary substances, as Iodine, and many salts.

Spiritus Tenuior.—Proof Spirit. Sp. Gr. ·920, as defined by the laws of Excise. Made by mixing Ov. of Rectified Spirit with Oiij. of distilled water. The tests as for Rectified Spirit. (Dr Christison states that the E. C. adopted the standard of Proof Spirit ·920 in its Pharmacopœia of 1839, but had been led to alter the density to ·912, because a Spirit of this strength, which is produced by mixing *one measure of water* and *two of Commercial Rectified Spirit*, had been long adopted in practice for preparing Tinctures by all the leading druggists of Edinburgh.)

The properties of Proof Spirit are necessarily of the same nature as Rectified Spirit, and though weaker as a solvent of some things, especially Gum Resins, it is sufficiently strong for the majority of officinal tinctures. And though it consists of barely one-half Alcohol, it is sufficiently powerful as a stimulant. It is made by mixing Ov. of the Rect. Spirit of the B. P. (·838) with 3 of Dist. water. It contains 51 of water, and 49 of Alcohol, in 100 parts.

Spiritus Vini Gallici, B. Spirit of French Wine. Brandy.

Spirits distilled from various fermented substances form our several varieties of Ardent Spirit, which may be considered as Alcohol diluted to the strength of Proof Spirit, and mixed with some volatile ingredients. Brandy, because made from Wine, is distinguished as being free from Grain Oil. Rum is obtained from fermented Molasses. Whisky from malted Barley or Rye. Holland Gin is prepared from malted Barley and Rye, and Rectified with Juniper Berries. Common Gin from malted Barley, Rye, or Potatoes, and rectified with common Turpentine. The *Arrak* of the East is described as being made from Rice; but the word signifies Spirit, and it is made from a variety of substances. Mr Brande has ascertained that these several spirits contain from 51 to 54 per cent. of Alcohol.

Mistura Spiritus Vini Gallici, B. Mixture of Spirit of French Wine. Brandy Mixture.

Prep.—Take of *Spirit of French Wine*, *Cinnamon water*, of each, f℥iv.; the *Yolks of two Eggs*; *refined Sugar*, ℥ß. Rub the Yolks and Sugar together, then add the Cinnamon water and Spirit.

Restored from L. P. It resembles "*Egg flip*," and is an excellent stimulant in extreme cases of exhaustion.

Dose.—f℥j.–f℥ij.

Action. Uses.—All Spirits are Diffusible Stimulants, and well known for their intoxicating properties. Even in moderate quantities they produce temporary excitement of all parts of the system, followed by corresponding depression. In small quantities they are sometimes useful to health; but in general their use can be abstained from with benefit. Dr Paris has particularly distinguished Brandy as being Cordial and Stomachic; Rum as Heating and Sudorific; Gin and Whisky both as Diuretic. Spirit diluted is often used as a cooling lotion, but it must then be allowed to evaporate; if covered up, it will act as a Rubefacient. Both Alcohol and proof Spirit are used as solvents for numerous officinal preparations.

VINUM XERICUM, B. Sherry Wine. (From Spain.)

Sherry, commonly called White Wine, is officinal as a solvent for some active medicinal substances. Wine is also itself employed beneficially as a Stimulant. Though all fermented liquors obtained from the juice of fruits are called Wines, good Wine is prepared only from the Grape, because its juice, besides Sugar dissolved in a large portion of water,—and a glutinoid substance, or vegetable albumen, in its husk,—contains, as its active principle, Bitartrate of Potash, which, being insoluble in Alcohol (*see* p. 97), is deposited as the fermentation proceeds, and thus removes a great portion of the acid out of the Wine. The albuminons matter of the Grape juice absorbing Oxygen from the atmosphere, and passing into decomposition, thus acts as a ferment to the Sugar, and causes it to be converted into Alcohol when the changes take place which have already been described. Besides this, there is already developed a little Volatile oil, and, according to Liebig and Pelouze, a small quantity of an aromatic substance, which they have called Œnanthic Ether, to which, and also to the Oil, Wines owe their peculiar flavour. Differences are observed in the Wines of every locality; they are sometimes divided into *dry* and *sweet* Wines; also into *still* and *sparkling*. Thus, in cases where the proportion of Sugar is small, and that of the albuminous matter large, the Sugar becomes entirely converted into Alcohol, the Wine is said to be dry, and, having become *still*, may be kept for some time to ripen. In other cases, where the proportion of ferment is small, and that of the Sugar large, the latter partly remains unconsumed, and the Wine is sweet. *Sparkling* Wines are those which have been bottled before the fermentation, though advanced, has entirely ceased; the Carb′ gas, which naturally escapes as soon as the pressure is removed, causing the appearance of sparkling. The acidity of Wine may be caused by Bitartrate of Potash, or by the formation of Acetic acid. The colour of Wine is of different degrees of straw-colour when the juice of the Grape is alone used; but it becomes red when the skins or husks are left in the liquor while in a state of fermentation. As ascertained by Mr Brande, the stronger Wines, such as Lissa, Raisin Wine, Marsala, Port, Madeira, Sherry, Teneriffe, Constantia, Malaga, contain from 18 or 19 to 25 per cent. of Alcohol. The lighter Wines, such as Claret, Sauterne, Burgundy, Hock, Champagne, Hermitage, and Gooseberry Wines, from 12 to 17 per cent. of Alcohol. Sherry varies much in colour and in strength. The B. P. describes it as "pale yellowish-brown, containing about 17–18 per cent. of Alcohol."

It is used to make the medicinal Wines of the Pharmacopœia. Wines are considered less intoxicating than Spirit and water of the same strength, because the Alcohol, being combined with the mucilaginous, Extractive, Colouring, and Astringent principles of the Wine, is supposed to be in this state less diffusible in its action. Sherry is preferred as a solvent, in consequence of being more free from colouring matter, and containing less acid. As a Cordial and Tonic, Wine must be selected according to the nature of the case.

CEREVISIÆ FERMENTUM, B. Beer Yeast.

Though neither Ale nor Beer are officinal, they may be noticed as differing from Wine, in containing a larger proportion of mucilaginous and extractive matters, derived from the Malt with which they are made. They often contain a free acid, or are ready to enter into the acetous fermentation. The bitter principle of the hop assists in preserving Malt liquors, as well as adds to their tonic effects. According to Mr Brande, Ale and Porter contain from 4 to near 10 per cent. of Alcohol. The *Yeast*, which makes its appearance on the surface of fermenting Wort, and is produced from the Glutinoid substance in the brewing of Malt liquors, is itself officinal. It is a light, soft substance, of a greyish-yellow colour, which readily putrefies if kept moist; if dried, it becomes brownish, and may be kept for some time. When magnified, it appears composed of vesicles containing globules, and is, in fact, entirely composed of a minute fungus, consisting of microscopic cellules, round or oval, separate, or in rows. It has been named *Torula Cerevisiæ*.

Action. Uses.—Stimulant when applied externally, and used in the form of a poultice.

CATAPLASMA FERMENTI, B. Yeast Poultice.

Prep.—Mix *Beer Yeast*, and *water* heated to 100°, āā f℥vj., add *Flour* ℥xiv., and stir it in. Place it near the fire until it rises. (Fermentation is induced in the saccharine part of the flour, Carbonic acid being disengaged, and a small quantity of alcohol produced.)

ÆTHER, B. Ether. Oxide of Ethyle. *Sulphuric Ether*.

If Alcohol, or better, if Rectified Spirit, be mixed and distilled with Sulphuric acid, a light, very inflammable liquid is produced, which is well known by the name of Ether, being also called Rectified, and Sulphuric Ether. The Ethers produced by the action of other acids besides Sulphuric contain a portion of each acid or its elements, differ essentially from each other, and are distinguished by the name of the particular acid used.

Pure Ether is colourless and transparent, very light and limpid, of a powerful and peculiar, but rather pleasant odour, and of a warm pungent taste, afterwards feeling cool. Sp. Gr. ·720. It is extremely volatile. The Sp. Gr. of its vapour is high, being 2·586. It evaporates even in pouring from one vessel to another, feeling very cold if evaporated from the surface of the hand; and, being very inflammable, it is apt to take fire on the near approach of a light. Its vapour, when enhaled, first exhilarates, then produces a kind of intoxication, and subsequently, if given in sufficient quantity, causes complete anæsthesia, or insensibility to the feeling of pain. It boils at 96°, under the ordinary pressure of the atmosphere, and has been frozen at – 47°, becoming a white, crystalline mass. It burns with a bright flame, producing Carbonic acid and water. When much exposed to the atmosphere it becomes by degrees converted into Acetic acid and water. Ether may be mixed in all proportions with Alcohol, and one part with nine of water. It readily dissolves Resins, Caoutchouc, Volatile and fixed Oils; Sulphur and Phosphorus in a smaller proportion; several Vegeto-Alkalies, and some neutral crystalline principles. Ether is composed of $C_4 H_5 O$; its elements constitute an Oxide of the base Ethyle ($C_4 H_5$), which has been isolated by Gerhardt.

The Ether of the Pharmacopœia, as prepared below, contains as much as 8 per cent. of Alcohol by volume, "not less than 92 per cent. by volume of pure Ether." (B.) Sp. Gr. ·735. It boils below 105°. "50 measures agitated with an equal volume of water are reduced to 45 by an absorption of 10 per cent." (B.)

Prep.—One equivalent of Ether and one of water make up an equivalent of Alcohol. When equal parts of Rectified Spirit and strong Sulphuric acid are mixed together, and submitted to distillation, Ether distils over, the atom of water being left behind with the acid. But it is not a simple abstraction of the elements of water by means of the Sulphuric acid; the change seems to be more complicated. If the spirit and acid are mixed, raised to the boiling-point, and then left to cool, a peculiar compound acid, called Sulphovinic acid, is formed. It contains the elements of 1 equivalent of Alcohol, and 2 of Sulphuric acid ($C_4 H_5 O, H O, 2 S O_3$). But as soon as the liquid is submitted to distillation, this compound acid is again decomposed, Ether distilling over, and Sulphuric acid and water remaining in the retort.*

The difficulty of the process consists in the fact, that it only goes on properly when conducted at a certain temperature. Sulphuric acid distils at a high temperature, and Rectified Spirit at a low one; and the distilling point of the mixture depends upon the proportions of these ingredients. If so much Spirit be present that the boiling-point is below 260° F., Alcohol is found to distil over, instead of Ether. Or when there is so much acid that the boiling-point is above 320°, a number of empyreumatic products are formed, as Olefiant gas, and Heavy Oil of Wine. The boiling-point may vary from 260° to 320°, or should be as close as possible to 280°, to insure the production of a pure Ether. But as the process goes on, the Ether distilling, and the amount of spirit in the retort diminishing, the boiling-point tends to rise, and the product will at length be contaminated by the above-mentioned compounds. To remedy this difficulty the *continuous process* was invented, which consists in the continual addition of fresh quantities of Rectified Spirit to the fluid in the retort. By this means the boiling-point is kept down to the proper standard, and it is found that the same quantity of Sulphuric acid is sufficient for the etherification of a large quantity of Alcohol.

On this principle is founded the formula of the B. Pharmacopœia.

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* Several other explanations have been offered of the process of Etherification. Mr Graham doubts whether Sulphovinic acid is not rather a hindrance than an aid in these changes; and M. Robiquet believes that Olefiant gas is first formed by the action of the $S O_3$ on a part of the Alcohol, and that this at once unites with another proportion of Alcohol, to form Ether ($C_4 H_4 + C_4 H_6 O_2 = 2 C_4 H_5 O$).

Prep.—B. Take of *Rectified Spirit*, f℥l.; *Sulphuric acid*, f℥x.; *Chloride of Calcium*, ℥x.; *Slaked Lime*, ℥ß; *Distilled water*, f℥xiij. Mix the Sulphuric acid and ℥xii. of the Spirit in a glass matrass capable of containing at least Oij., and, without allowing the mixture to cool, connect the matrass by means of a bent glass tube with a Liebig's condenser, and distil with a heat sufficient to maintain the liquid in brisk ebullition. As soon as the ethereal fluid begins to pass over, supply fresh Spirit through a tube into the matrass in a continuous stream, and in such quantity as to equal the volume of the fluid which distils over. For this purpose use a tube furnished with a stopcock to regulate the supply, connecting one end of the tube with a vessel containing the Spirit raised above the level of the matrass, and passing the other end through a cork fitted into the matrass. When the whole of the Spirit has been added, and f℥xlij. have distilled over, the process may be stopped. Dissolve the Chloride of Calcium in the water, add the Lime, and agitate the mixture in the bottle with the impure Ether. Leave the mixture at rest for ten minutes. Pour off the light supernatant fluid, and distil it with a gentle heat until a glass bead of Sp. Gr. ·735 placed in the receiver begins to float. The Ether and Spirit retained by the Chloride of Calcium and by the residue of each rectification may be recovered by distillation and used in a subsequent operation.

The Ether, which is procured by this process as above explained, contains at first both water and Sulphurous acid. These are removed by the Chloride of Calcium and the Lime.

The Ether of the Pharmacopœia contains some Alcohol. There should not be more than 8 parts of this in 100, as shown by the Sp. Gr., which should be ·735. It is often adulterated with Rectified Spirit and with water, of which it will take up a small quantity. ℥j. should form a limpid solution with ℥x. of water. If turbid, the Ether contains some Oil of Wine. *Pure Ether* is obtained for chemical purposes by washing this Ether with water, and in distilling it with absolutely dry Chloride of Calcium and Lime.

Action. Uses.—Diffusible Stimulant and Antispasmodic; Carminative. Frequently prescribed in Spasmodic affections, and often to relieve Flatulence. In Hysterical and in Nervous complaints in general, in Dyspnœa, Nervous Colic, and similar affections, it is very effective, especially if prescribed with Laudanum, or a solution of the Salts of Morphia.

Shortly before the discovery of Chloroform, it was found that when Ether was allowed to be inhaled into the lungs, it gradually produced insensibility to feeling and pain. It was therefore employed as an Anæsthetic in surgical operations. But having been found less efficient than Chloroform, and more irritant to the nervous system, its use for this purpose has been nearly abandoned. Ether, as well as Choloroform, may be employed as a local Anæsthetic in the form of spray.

Dose.—♏xv.–fʒj. and repeated in a short time if necessary.

SPIRITUS ÆTHERIS, B. Spirit of Ether.

Prep.—Mix *Ether* ℥x. with *Rectified Spirit* Oj. The density of this preparation ought to be ·809.

Action. Uses.—Diffusible Stimulant.

Dose.—♏xxx.–♏xc.

[SPIR. ÆTHERIS COMPOSITUS, L. Compound Spirit of Ether.

Prep.—L. Mix together *Ether*, f℥viij.; *Rectified Spirit*, f℥xvj.; *Ethereal Oil*, fʒiij.

Action. Uses.—Stimulant, Antispasmodic, Anodyne ; hence useful in cases of Nervous Irritation, and want of sleep ; often prescribed with Opiates, in doses of fʒß–fʒij.]

[OLEUM ÆTHEREUM, L. Ethereal Oil. *Heavy Oil of Wine.*

This substance is formed towards the end of the distillation of Sulphuric Ether, or produced by distilling spirit with an excess of Sulphuric acid. It is an oily-looking liquid, which when washed has a bitter, somewhat aromatic taste, and a peculiar odour. It is insoluble in water, but soluble in Rectified Spirit and in Ether.

Prep.—Mix *Rectified Spirit* Oij. cautiously with *Sul'* f℥xxxvj. and distil until a black froth appears, when the retort is to be immediately removed from the fire. (Ether, water, Sulphurous acid, and an oily liquid which floats upon the water, are produced.) The light fluid is to be separated from the heavier, and to be exposed for a day to the air. (The Ether present evaporates.) *Sol. of Potash* f℥j. or q. s. mixed with an equal quantity of water, is to be well shaken with the oily liquid. (The free Sulphurous acid is removed.) Separate the Ethereal Oil which subsides, and wash it well.

Tests.—L. P. "It has a Sp. Gr. of 1·05. If dropped into water it immediately falls to the bottom, preserving a globular form. It is soluble in Ether. It does not redden Litmus." Ethereal Oil, when boiled in water, separates into Sulphovinic acid (*see* p. 716), and a light liquid hydrocarbon, called *Etherine*, or *Light Oil of Wine*, which is composed of $C_4 H_4$. The Heavy Oil is found on analysis to contain the elements of one equiv. of each of these substances, minus an atom of water. It is therefore supposed to contain a Sulphate of Ether, and a Sulphate of Etherine ($C_4 H_5 O, S O_3 + C_4 H_4, S O_3$). But it varies somewhat in composition.

This Oil is not officinal in the B. P., but forms an ingredient in the Compound Spirit of Ether of the L. P., which was intended as a substitute for the Anodyne liquor of Hoffman.]

SPIRITUS ÆTHERIS NITROSI, B. Spirit of Nitrous Ether. A spirituous solution, containing Nitrous Ether. Sweet Spirits of Nitre.

This preparation used to be obtained by distilling Nitric acid with Rectified Spirit. The acid becoming deoxidised, to form Nitrous[*] or Hyponitrous acid ($N O_3$), this combined with the Ether in the Spirit to form Nitrous (or Hyponitrous) Ether. The Nitrous Ether was then dissolved in the remainder of the Spirit. The L. C. used ℥iijß of the Acid (1·42) to Oij. of Rect. Spirit, distilling off ℥xxviij.

Mr Brown (P. J. xv. 400) states that the composition of the Spirit of Nitre sold in the shops as prepared according to the directions of the L. C., varies

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[*] The acid ($N O_3$) called *Nitrous acid* in the B. P., is known as *Hyponitrous acid* to most chemists, and is so entitled at p. 41 of this work. By the terms *Nitrous Ether* and *Hyponitrous Ether* the same compound is intended. The name of *Nitric Ether*, however, long employed, and retained in the L. P., was altogether inapplicable, as the spirit does not contain that compound.

extremely, sometimes as much as 10, sometimes as little as 1 per cent. of the Hyponit. Ether being present. Aldehyde is always contained in this spirit, and the mixture, however well prepared, will decompose and become acid after a time. This is especially the case when too large a proportion of the ether is present. A spirit containing only 10 per cent. is recommended as the least likely to decompose.

The fact that the spirit of the L. C. sometimes contains little more than water and Alcohol was accounted for by Dr G. Bird, who showed that the whole quantity ordered might be distilled over before the production of Hyponit. Ether had commenced. This Ether might afterwards be found in the residue in the retort. Irregular reactions have also been found to occur, by which Nitric and Nitrous ethers are produced, as well as Hyponit. ethers. "Nitric Ether" is often made by using methylated spirit instead of Alcohol.

Attempts have been made from time to time to improve upon this process, which yields a somewhat variable result. The E. C. prepared Hyponitrous Ether first, and mixed it then with four volumes of Rectified Spirit. In the B. P. (1864), it was attempted to prepare the NO_3 by acting upon the Nitrite of Soda with Sulphuric acid. The Acid thus obtained is brought in contact with Rect. Spirit at the same time, the three being distilled together. The intention of this formula was excellent, but unfortunately it gave a more uncertain result than that of the L. P., with which so much fault had been found. Prepared by the directions of the B. P., 1864 (*see* p. 115), the "Nitrite of Soda" would be a heterogeneous compound, utterly unfit to be used in any process requiring exactness. It is a mixture of Nitrate and Nitrite (or Hyponitrite), with some Carbonate and Caustic Soda. Mr Squire finds that it never contains more than 25 per cent., sometimes as little as 5 per cent. of the salt whose name it bears. The strength of the Nitric Ether thus made, would of course vary according to the composition of this "Nitrite."

Prep.—B. (1867) Take of *Nitric acid*, f℥iij.; *Sulphuric acid*, f℥ij.; *Copper*, in fine wire (about No. 25), ℥ij.; *Rectified Spirit*, a sufficiency. To one pint of the Spirit add gradually the Sulphuric acid, stirring them together; then add, in the same way, f℥ijß of the Nitric acid. Put the mixture into a retort or other suitable apparatus, into which the Copper has been introduced, and to which a thermometer is fitted. Attach now an efficient condenser, and applying a gentle heat, let the Spirit distil at a temperature commencing at 170° and rising to 175°, but not exceeding 180°, until f℥xij. have passed over and been collected in a bottle kept cool, if necessary, with ice-cold water; then withdraw the heat, and having allowed the contents of the retort to cool, introduce the remaining ℥ß of Nitric acid, and resume the distillation as before, until the distilled product has been increased to f℥xv. Mix this with Oij. of the Rectified Spirit, or as much as will make the product correspond to the tests of specific gravity and percentage of Ether separated by Chloride of Calcium. Preserve it in well-closed vessels.

This process, invented by Mr Redwood, yields a more uniform product than any heretofore resorted to. The Nit. acid is deoxidised by the Copper, with the formation of Nitrous acid (NO_3), and Oxide of Copper, the last uniting with the SO_3 to form a Sulphate. Simultaneously with this production of Sulph. Copper, the strong acids act upon the Spirit, removing its water, and forming Ether (*see* p. 715). This unites with the NO_3, producing Nitrous (or Hyponitrous) Ether, which distils over, and is mixed with Oij. or q. s. of Rect. Spirit, to form the Spirit of Nitrous Ether of the B. P.

Spiritus Ætheris Nitrosi is stated by the B. P. to consist of Nitrous Ether ($C_4 H_5 O, N O_3$) dissolved in Rectified Spirit. Sp. Gr. ·845. It should be but slightly acid, effervescing feebly or not at all when shaken with a little Bicarb. Soda. The presence of Nitrous acid is shown by a dark-brown colour produced with Sulphate of Iron and Sulphuric acid. It is stated in the Pharmacopœia that this Spirit, when shaken with two volumes of a saturated solution of Chloride of Calcium, separates into two layers, the upper one of two per cent. of Nitrous Ether.

Pure Hyponitrous Ether has a pale yellow colour, and an ethereal smell resembling that of ripe apples. Its Sp. Gr. is about ·898°. It is very volatile, boiling at about 65°, and exceedingly inflammable. It mixes with Alcohol and Ether in all proportions, and is soluble in about 50 parts of water.

The Spirit is colourless or of a light straw colour, having the peculiar but agreeable odour and flavour of the Hyponitrous Ether, though of course less strong. It is mobile, volatile, and inflammable, almost always a little acid, especially if it has been kept any time. It mixes in all proportions with water, and with Alcohol. The Sp. Gr. is apt to vary much.

Action. Uses.—Stimulant and Antispasmodic. Diuretic, and by management, Diaphoretic, in doses of fʒß–fʒij. As a Diuretic it is best combined with others, as Squills, Acetate of Potash, &c.

As a diaphoretic (the patient being kept warm and in the recumbent posture) it is in very frequent use, and may be given alone, combined with salines, or with opium, &c.

SPIRITUS PYROXYLICUS RECTIFICATUS, B. (1864.) Rectified Pyroxylic Spirit. *Methylic Alcohol. Wood Spirit.*

This Spirit is obtained by the destructive distillation of wood, which also produces Tar, Vinegar, and a number of other chemical products useful in the arts. The fluid which first comes over contains the spirit, which is re-distilled once or twice to form "purified wood Naphtha." (It is quite distinct from true Naphtha, which is a simple hydrocarbon.) *Methyle*, $C_2 H_3$, is a radical which bears a close resemblance to *Ethyle*, and is the base of similar compounds. Pyroxylic Spirit has the composition ($C_2 H_3, O, H O$), and is therefore the Alcohol of Methyle. The impure spirit is used extensively in the arts as a solvent for resins, and employed in lamps as a substitute for Spirit of Wine. It has a peculiar smoky odour and taste. It contains *Acetone*, various volatile oils, and a peculiar crystalline substance described by Scanlan under the name of *Pyroxanthin*. For medicinal use it may be purified by distillation off Chloride of Calcium. The B. P. (1864) allowed it to contain 10 per cent. of water, and described it as "Colourless, mobile, and inflammable, burning with a pale-blue flame, having a spirituous odour and a warm ethereal taste with a peculiar after taste."

Omitted in B. P. 1867.

Tests.—Specific gravity 0·841 to 0·846. Without action on Litmus paper, free from smoky taste. Is not rendered turbid by mixture with water.

Action. Uses.—Similar to those of Alcohol. It is more nauseous. This is not the liquid recommended by Dr Hastings as a remedy for consumption. This is *Pyroacetic Spirit* or *Acetone*, produced by the distillation of the Acetates. It has the composition C_3 H_3 O, and is not miscible with water.

Methylated Spirit is a mixture of one part of Pyroxylic Spirit with nine parts of Spirits of Wine. By a recent Act of Parliament it is allowed to be sold free of excise duty, and is largely used for manufacturing purposes. A chemical report from Messrs Graham, Hofmann, and Redwood, stating that the mixture could not possibly be rendered potable, as by no chemical process can it be freed from its peculiarly disagreeable odour and taste, was presented to government before the Act was passed. Methylated Spirit should on no account be used in the preparation of any of the Pharmacopœia tinctures. Ether, Nitrous Ether, and Chloroform are, however, prepared from it. There is reason, moreover, to fear that the nauseous liquid is not unfrequently used as an adulteration of Gin, Hollands, Absinthe, and other spirituous liquors in which its taste may not be perceived or not considered objectionable.

CHLOROFORMUM, B. Chloroformyl, L. Chloroform. Terchloride of Formyle.

Chloroform (C_2 H, Cl_3) is the Terchloride of a hypothetical radical, called *Formyle* (C_2 H), the Teroxide of which is known under the name of *Formic acid.*

Chloroform was discovered by Soubeiran in 1832. In 1842 Dr M. Glover investigated its action on animals. But it was not until 1847 that it was introduced to the profession as an anæsthetic agent by Dr Simpson of Edinburgh. It was first obtained by the action of caustic alkalies upon Chloral, a peculiar liquid obtained by passing Chlorine gas into anhydrous alcohol. But it is more easily prepared by distilling alcohol or wood spirit with Chlorinated Lime.

Prep.—B. Take of *Chlorinated Lime*, ℔x.; *Rectified Spirit*, f℥xxx.; *Slaked Lime*, a sufficiency; *Water*, Ciij.; *Sulphuric Acid*, a sufficiency; *Chloride of Calcium*, in fragments, ℥ij.; *Distilled water*, f℥ix. Place the Water and Spirit in a capacious still, and raise the mixture to the temperature of 100°. Add the Chlorinated Lime and five pounds of the Slaked Lime, mixed thoroughly. Connect the still with a condensing worm encompassed by cold water, and terminating in a narrow-necked receiver; and apply heat so as to cause distillation, taking care to withdraw the fire the moment that the process is well established. When the distilled product measures fifty ounces, the receiver is to be withdrawn. Pour its contents into a gallon bottle half-filled with Water, mix well by shaking, and set at rest for a few minutes, when the mixture will separate into two strata of different densities. Let the lower stratum, which constitutes crude Chloroform, be washed by agitating it in a bottle with three ounces of the Distilled water. Allow the Chloroform to subside, withdraw the water, and repeat the washing with the rest of the Distilled water, in successive quantities of three ounces at a time. Agitate the washed Chloroform for five minutes in a bottle with an equal volume of Sulphuric acid, allow the mixture to settle, and transfer the upper stratum of liquid to a flask containing the Chloride of Calcium mixed with half an ounce of Slaked Lime, which should be perfectly dry. Mix well by agitation. After the lapse of an hour, connect the flask with a Liebig's condenser, and distil over the pure Chloroform by means of a water bath. Preserve the product in a cool place, in a bottle furnished with an accurately ground stopper.

The lighter liquid, which floats on the crude chloroform after its agitation with water, and the washings with distilled water, should be preserved, and employed in a subsequent operation.

The process resembles that detailed some years age by M. Dumas, who purified his product by agitation with half its volume of Sulphuric acid. This plan was imitated by Professor Gregory of Edinburgh, and at one time was extensively adopted by the manufacturers. It is introduced in the B. P., but it appears to be unsafe and unadvisable. It was early condemned as unnecessary by Soubeiran, and the decomposition of the Chloroform purified by this mode has been admitted by Dr Christison. The acid appears to combine with and to remove some oily impurity, which causes it to blacken, and the Chloroform thus treated, being separated from the acid and the water, by mixing with Chloride of Calcium and Lime, and then distilling, appears for some time unexceptionably pure. But the contact of the strong acid has in some way rendered it liable to undergo destructive change. After a variable time, perhaps some months, or more quickly if exposed to air and light, the Chloroform thus prepared becomes acid to Litmus paper, and acquires a suffocating odour. It then contains Hydrochloric acid and free Chlorine; and a peculiar greenish oil has been observed to form, and to adhere to the sides of the bottle. This decomposed liquid is dangerously irritant, and totally unfit for medical use.

The safest way known of purifying Chloroform consists in agitation with pure water, and redistillation. (See P. J. x. 25, 253.)

The B. process differs from that of the L. P. in using Lime as well as Chlorinated Lime, as well as in the employment of Sulphuric acid in the purification.

Some complex chemical changes take place in the manufacture of Chloroform.

Calx Chlorata (page 130) consists of *Hypochlorite of Lime* ($Ca\,O, Cl\,O$), and Chloride of Calcium. The Hypochlorite is the substance concerned in these changes. It is supposed that the first step is the formation of *Chloral* ($C_4\,H\,Cl_3\,O_2$), a substance already mentioned as giving rise to Chloroform when acted upon by alkaline substances. It is a thin, colourless, volatile liquid, of a penetrating odour. Two equivalents of Alcohol and 8 of Hypochlorite of Lime, contain the elements of 1 equivalent of Chloral, 1 of Lime, and 9 of water,—with 5 of Chloride of Calcium, and 2 of Formiate of Lime—

$$C_8\,H_{12}\,O_4 + Ca_8\,O_8,\ Cl_8\,O_8 = C_4\,H\,Cl_3\,O_2 + Ca\,O + 9\,H\,O$$
$$+\,5\,Ca\,Cl + 2\,(Ca\,O,\ C_2\,H\,O_3).$$

In the next change the salts of Lime, placed at the end of the equation, are unconcerned. The *Chloral* and *Lime*, with one out of the nine atoms of *water*, react upon each other, so as to produce one equivalent of *Chloroform*, which distils over, and one more of *Formiate of Lime*, which remains behind in the retort—

$$C_4\,H\,Cl_3\,O_2 + Ca\,O + H\,O = C_2\,H\,Cl_3 + Ca\,O,\ C_2\,H\,O_3.$$

Chloroform is a transparent, colourless, oily, heavy fluid. Its Sp. Gr. is 1·49. It has a fragrant ethereal odour, rather resembling that of apples, and a burning, but sweet and pleasant taste. It is slightly soluble in water (in 2000 parts, Christison), very soluble in alcohol and ether; it dissolves volatile Oils, Camphor, Resins, Wax, Caoutchouc, and some vegetable Alkaloids. It also dissolves Iodine and Bromine, and, according to Liebig, Sulphur and Phosphorus. It is volatile without change. It boils at 141°, and is entirely dispelled by heat; it can be inflamed with difficulty, having a greenish flame. It also evaporates quickly at ordinary temperatures. The mineral acids tend to decompose it; Nit. acid immediately; Sulph. and Hydrochlor. acids slowly. Boiled for some time with a caustic alkali, it is decomposed, a chloride and a formiate of the base being produced.

Tests.—B. P. "Sp. Gr. 1·49. It is not coloured by agitation with Sulphuric acid, leaves no residue and no unpleasant odour after evaporation."

1. *Alcohol* is frequently present in commercial Chloroform. The Sp. Gr. is reduced by it. Pure Chloroform, dropped into water, falls to the bottom, and remains bright and limpid; but if it contain Alcohol, the surface of the drop becomes opaline. If the same experiment be made with diluted Sulph. acid of Sp. Gr. 1·44, the drop of pure Chloroform will fall to the bottom; but that which contains spirit, if not shaken, will float or remain suspended in the acid solution. (Acar.) Pure Chloroform will not readily take fire, but it does so immediately when ether or alcohol is present. M. Besnou states further that pure Chloroform is unaffected by a morsel of bright Potassium, but if much Spirit be present the metal at once inflames, turning the liquid brown, and evolving an acrid vapour. (This test was adopted in the B. P., 1864.) Also, that Chloroform containing more than 5 per cent. of Alcohol is distinguished by the power of decomposing a solution of Chromic acid, producing a green colour by the formation of Chloride of Chromium.

2. *Ether* is sometimes added; and the tests for its detection are very much the same as those for Alcohol. M. Rabourdin adds to these that a solution of Iodine in pure Chloroform has a violet colour; but that when the latter contains any Ether, this solution becomes reddish. The presence of Ether in any amount would considerably lower the specific gravity.

3. *Chloral* may be present, when the quantity of Lime used in the process is insufficient to render the decomposition perfect. It has a penetrating odour, and a Sp. Gr. of 1·5; but it is not easy to detect it.

4. *Heavy Volatile Oils.*—Some compounds of this description, having a powerful odour and injurious action on the organism, are occasionally found in inferior specimens. Their nature is not well understood. Soubeiran and Mialhe have found a Chlorinated Oil, heavier than water. Mr Pemberton (U.S.) describes 2 Hydrocarbons of the Valerianic series having the composition $C_{10} H_{10}$. A drop of such Chloroform, when allowed to evaporate from the palm of the hand, will leave a strong smell behind it. The liquid will also blacken Sulphuric acid, if shaken with it. Such impurities are more likely

to occur when the Chloroform has been prepared from Pyroxylic Spirit, or from Whisky.

5. *Hydrochloric Acid* and *free Chlorine* are produced by the decomposition to which Chloroform is liable when prepared by a faulty process. The liquid has then the odour of Chlorine, and causes fumes with the vapour of Ammonia; it first reddens Litmus paper (H Cl), and subsequently bleaches it (Cl); and it precipitates a solution of Nitrate of Silver.

6. *Sulphuric Acid* may be present when the process of the B. P., or that recommended by Dr Gregory, has been adopted. *Manganese* is sometimes employed (D. P.) to free the Chloroform from this acid. By contamination with some compound of Manganese, the Chloroform may be caused to assume a pink colour.

Action. Uses.—The action of Chloroform in a small dose is simply stimulant and cordial; in larger quantity it produces inebriation; in still larger doses it brings on a complete loss of feeling and unconsciousness, or may cause death by a cessation of the heart's action. It paralyses the muscular system in the same manner as Opium, but still more effectually. Internally, in small doses, it is employed in spasmodic disorders, and as a stimulant and diaphoretic.

But the great use of Chloroform depends upon its remarkable action in producing, when its vapour is gradually inhaled (along with air) into the lungs, a complete insensibility to the feeling of pain. For this its inhalation is now most extensively adopted as a merciful preliminary to the painful operations of surgery. The patient is usually unconscious; but in the great majority of cases the employment of the remedy is safe,—though fatal cases have rarely occurred. Chloroform is used by some to mitigate the pains of parturition. For its relaxing power over muscle, it is employed to assist in the reduction of dislocations and of strangulated herniæ.

Dose.—Internally, ♏v.–♏x., dissolved in spirit, or suspended by means of mucilage or yolk of egg. For inhalation, fʒj. should be employed at first, and repeated as often as may be necessary. It should be breathed gradually from a handkerchief held near the mouth or applied in one of the inhalers invented for the purpose.

SPIRITUS CHLOROFORMI, B. Spirit of Chloroform.

Prep.—Dissolve *Chloroform* ℥j. in *Rectified Spirit*, ℥xix.—Sp. Gr. ·871.

A solution of 1 part of pure Chloroform in 7 of rectified Spirit has been much used under the fictitious names of *Chloric Ether* and *Terchloride of Carbon*. It is employed as a cordial and antispasmodic in low fevers and convulsive affections. The solution of the B. P. is one-third as strong.

Dose.—ʒß–ʒij.

LINIMENTUM CHLOROFORMI, B. Liniment of Chloroform.

Prep.—Mix *Chloroform* and *Liniment of Camphor*, equal parts.

Actions. Uses.—It is useful as an anæsthetic application in Neuralgia, Chronic Rheumatism, painful tumours, &c.

TINCTURA CHLOROFORMI COMPOSITA, B. Compound Tincture of Chloroform.

Prep.—Take of *Chloroform*, f℥ij.; *Rectified Spirit*, f℥viij.; *Compound Tincture of Cardamoms*, f℥x.
Mix. 1 in 10.

Introduced in 1867. For use internally as a cordial and carminative, but is in no respect an efficient substitute for the following.

Dose.—♏xx.–♏lx.

CHLORODYNE.—A secret medicine vended under this name, and the paternity of which has been the subject of an action at law, has been much used during the last few years as an anodyne and soporific. It appears to be a compound of Chloroform and Indian Hemp, containing also, perhaps, Morphia and Hydrocyanic acid. The following formula for its preparation has been given by Dr Ogden.

Prep.—Mix together *Chloroform*, ʒvj.; *Chloric Ether*, ʒj.; *Tincture of Capsicum*, ʒß; *Oil of Peppermint*, ♏ij.; *Hydrochlorate of Morphia*, gr. viij.; *Hydrocyanic acid* (Scheele's), ♏xij.; *Perchloric acid*, gr. xx.; *Tincture of Indian Hemp*, ʒj., and *Treacle*, ʒj.

Other formulæ have been published. It is a powerful preparation, prescribed in doses of ♏v.–♏x. (if made as above).

CHLOROMETHYLENE. Bichloride of Methylene.

Various compounds have of late years been proposed as substitutes for Chloroform in producing anæsthesia. *Amylene* was tried by Dr Snow, but soon given up. *Tetrachloride of Carbon* is recommended by Sir James Simpson. The compound above named, introduced by Dr Richardson, appears to have yielded the most satisfactory results. Chloro-methylene ($C_2\,H_2,\,Cl_2$) is obtained as follows:—

Prep.—*Chloroform* ($C_2\,H,\,Cl_3$) is decomposed by acting on it with *Zinc Filings* and *dilute Sulphuric acid.* 2 equiv. of Hydrogen forms with the Chloroform one atom of Hydrochloric acid and one of Bichloride of Methylene.

$$C_2\,H\,Cl_3 + 2\,H = H\,Cl + C_2\,H_2,\,Cl_2.$$

Some of the Chloromethylene sold is said to be spurious, consisting simply of a mixture of Chloroform and Ether.

It is a colourless limpid fluid, with an odour like that of Chloroform, which boils at 88° F. Its Sp. Gr. is 1·344, that of its vapour 2·937. (Richardson.) It volatilises far more easily than Chloroform, and burns readily in the air. Its vapour, when inhaled with the same precautions as that of Chloroform, produces anæsthesia speedily, and without preliminary excitement in any marked degree. The insensibility lasts longer, but passes off more suddenly. Chloromethylene is already being used in several London hospitals, and we are informed, after very many cases of its administration, that there has been no fatal accident. (Three parts of Chloro-methylene must be used for two of Chloroform.) It is used internally as an anodyne and antispasmodic, in doses of ♏xv.–♏xxx.

ALCOHOL AMYLICUM, B. Amylic Alcohol. Fousel Oil.

Fousel Oil, or *Oil of Grain*, is a light, colourless, oily fluid, with a strong odour, which may be obtained at any large distillery by continuing the distillation for some time after the pure spirit has been all drawn off. Having been first noticed in the distillation of spirit from Potatoes, it is often called *Oil of Potato Spirit.* It may be purified by re-distillation, rejecting the water which comes over first. It is a colourless liquid, with a penetrating odour and burning taste. Sp. Gr. ·818, and boiling point 270°. Sparingly soluble in water, but sol. in all proportions in Alcohol, Ether, and Essential Oils. (B.) Fousel Oil is the Alcohol or Hydrated Oxide of a hypothetical radical, *Amyle* ($C_{10} H_{11}$). Its composition is $C_{10} H_{11} O, H O$. When treated with oxidising agents, it is converted into *Valerianic acid* ($C_{10} H_9 O_3$), undergoing a change similar to that of Alcohol into Acetic acid. Fousel Oil is employed by the B. P. in the preparation of *Valerianate of Soda* (q. v.)

ACETOUS FERMENTATION AND DESTRUCTIVE DISTILLATION.

Acetic acid exists occasionally in plants, either in a free state or combined with Potassa, Soda, Lime. &c. Vinegar, being producible by simply exposing to a warm temperature the liquors which have undergone, or are susceptible of, the vinous fermentation, has been known from the earliest times. But in all cases some ferment requires to be present, as these substances must first undergo the vinous fermentation; for it is the Alcohol which is the subject of Acetous fermentation, and it may in other ways be made to yield the same products. Thus, though Alcohol when burnt in the open air produces Carbonic acid and water, if, when diluted with a little water, it be dropped by degrees upon finely-divided Platinum, the Oxygen of the air, attached to the extended surface of the metal, coming in contact with the thin film of spirit, by combining with it, changes its nature, and converts it into Acetic acid, the vapours of which may easily be perceived by their pungent odour. So the same spirit, with a little yeast, exposed to the action of the air, will speedily become converted into Acetic acid. In undergoing this change, the Alcohol unites with 4 equivalents of Oxygen to form 1 equivalent of Acetic acid and 3 of water—

$$C_4 H_6 O_2 + 4 O = C_4 H_3 H_3 + 3 H O.$$

Vinegar on the Continent is made by exposing Wine to the action of the air in partially-filled vessels. In this country a less pure Vinegar is made from an inferior kind of Beer, to which $\frac{1}{1000}$th part of Sul' is allowed to be added, to prevent further change from taking place. Both of these forms of Vinegar have been officinal. Acetic acid may also be obtained by the destructive distillation in close vessels of some hard dry woods (*see* Pyroligneous acid). All of these products are diluted forms of Acetic acid, which may, however, be obtained from them in a concentrated state.

ACETUM (BRITANNICUM), B. British Vinegar. Prepared by fermentation from Malt and Unmalted Grain.

ACETUM (GALLICUM). French or Wine Vinegar.

The old plan of making Vinegar was to expose a fermented infusion of Malt in large open vats, kept at a high temperature and in a current of air. Some Wine refuse was usually added as a ferment. The improved modern or German method is to allow the liquor to trickle slowly over wood shavings, which are arranged in deep tubs on wooden diaphragms perforated with holes. By this means, a large surface at once being exposed to the air, which passes in a current through side holes near the bottom of the vessel, the fermenting liquid is very rapidly acetified. Vinegar thus made contains about 4 or 5 per cent. of pure Acetic acid, along with some mucilaginous matters,—vegetable extractive, which gives it a brown colour,—and a peculiar ethereal product, upon which depend its characteristic flavour and odour.

French or Wine Vinegar is prepared abroad by allowing various wines to ferment spontaneously. It is rather stronger than the British, and is generally considered to have a finer aroma.

Distilled Vinegar.—Vinegar may be submitted to distillation, when the colouring Matter, Sul′, and other impurities, being left behind, the Vinegar becomes a colourless diluted Acetic acid. With the acid and water rises also the Spirituous substance which characterises all good Vinegar, and is the source of its peculiar aroma—that is, if the first part has not been unnecessarily rejected. The odour and taste of the distilled are less agreeable than that of good Vinegar. It is no longer officinal.

Tests.—Brownish; of a peculiar odour; Sp. Gr. 1·017–1·019. 445·4 *gr. by weight* (f℥j.) *of it require at least* 402 *gr. measures of the volum. sol. Soda for their neutralisation, corresponding to* 4·6 *per cent. of anhydrous Acetic acid.* If ten minims of solution of Chloride of Barium be added to a fluid ounce of the Vinegar, and the precipitate, if any, be separated by filtration, a further addition of the test will give no precipitate. (This allows only a minute quantity of Sulphuric acid). B. Sulphuretted Hydrogen causes no change of colour. Scarcely affected by Ba Cl or Oxalate Ammonia. Ammonia added in excess causes a purplish colour and slight turbidity.

Acidum Pyroligneum. Impure Acetic Acid, obtained by the destructive distillation of Wood.

Pyroligneous acid is considered to be a discovery of Glauber; but it is probable, as stated by Berzelius, that it was known to the Egyptians, as may be inferred from a passage of Pliny, in which Pine wood, heated in a furnace, gives it out—“Sudore, aquæ modo, fluit canali: hoc in Syria *cedrum* vocatur, ac tanta est vis, ut in Ægypto, corpora hominum defunctorum, eo perfusa, serventur.” In the present day the distillation is usually conducted in iron cylinders, with condensers attached. The woody matter being decomposed by heat, its elements unite to form fresh compounds, and by distillation an acid liquor passes over with water, tarry matter, Empyreumatic Oil, and much inflammable gas, while a large proportion of excellent charcoal is left in the retort. The Pyroligneous acid is a brown transparent liquid, which consists essentially of Acetic acid, diluted with water, holding in solution tar, with some Empyreumatic Oil, and having a smoky smell. Pettenkofer has found that it is apt to contain also Pyrogallic acid. It may be purified by distillation; or, by the addition of Carb. Soda, an Acetate of Soda may be formed,* which is to be used for making a purer Acetic or Pyroligneous acid. This Acetate is purified by crystallisation and re-solution, and then decomposed by Sul′: the Acetic′ set free is again distilled, and the processes repeated until a nearly colourless acid, with the odour of the Acetic, is produced. Purified Pyroligneous acid, of density 1·044, constitutes the *Acidum Aceticum* of the B. P.

ACIDUM ACETICUM, B. Acetic Acid.

Acetic acid, which is the basis of the foregoing acids, may be obtained in a concentrated state by decomposing an anhydrous Acetate, as that of Soda, with Sulphuric acid. When set free, being volatile, it may be distilled and condensed, and is readily recognised by its peculiar and grateful odour. It is limpid and colourless, acrid in taste, and will blister the skin, unless moderately diluted. It is exceedingly volatile, even at ordinary temperatures. Its vapour is inflammable. It may be crystallised at 60°, forming large colourless crystals, when it is called Glacial Acetic acid. Pure Acetic acid is composed of $C_4H_3O_3 = Ac'$, with 1 Eq. of Water. Anhydrous Acetic acid has lately been obtained by Gerhardt. It is supposed to be the teroxide of an organic radical called *Acetyle*, C_4H_3, which has been traced in a chain of substances which presents a striking similarity to the *Ethyle* series. When anhydrous, it is a colourless, mobile, highly refractive liquid, heavier than water, and dissolving with difficulty. The last is not the case with the hydrated acid. Acetic acid may be mixed in all proportions with water, Alcohol, and Ether. It dissolves Camphor, several Resins, and Volatile Oils, which therefore are frequently employed for aromatising it. It forms numerous important salts, with metallic oxides, alkalies, and vegeto-alkalies. But the Acetates are decomposed by most of the acids, except the Carb′. An important fact, first investigated by Mr Clark, is, that the Sp. Gr. does not always bear an exact relation to the strength of the acid. The strength and the density go on increasing in a pretty uniform ratio till the latter arrives at 1·077; but as the strength increases still further, the density gradually sinks again to 1·063. Dr Christison observes that the density is a tolerably correct measure of strength up to 1·062; and above this point it becomes equally so, on observing whether the addition of a small percentage of water raises or lowers it. Acetic acid of the B. P. has a Sp. Gr. 1·044, and contains 28 per cent. of Anhydrous acid. It is a little weaker than the acid of the L. P. 182 *gr.* = 1000 *measures volum. sol. Soda.* (B.) The following are the strong Acetic acids of the Pharmacopœia, with their strength, and the percentage of real Acetic acid which they contain. Several other acids, of different strength, were officinal in the old Pharmacopœias.

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* Sometimes Chalk is first added, and Acetate of Lime is formed, which is decomposed by digestion with Sulphate of Soda.

1. Acidum Aceticum glaciale	s. g. 1·065: 85 per cent.
2. Acidum Aceticum	s. g. 1·044: 28 per cent.

Acidum Aceticum glaciale, B., may be prepared as follows:—

Prep.—Take of *Acetate of Soda* ℥xx., *Sulphuric acid* f℥viij. Place the Acetate of Soda in a porcelain basin on a moderately warm sand bath, apply heat till it liquefies, and continuing the heat, stir until the salt becomes pulverulent; let the heat be now raised so as to produce fusion, and then instantly remove the salt from the fire. As soon as it has cooled break up the mass, and place it in a stoppered retort capable of holding three pints, and connected with a Liebig's condenser. Pour the Sulphuric acid on the salt, quickly replace the stopper, and when the distillation of Acetic acid begins to slacken continue it with the aid of heat until six fluid ounces have passed over. Mix one fluid drachm of the Acetic acid thus obtained with a fluid drachm of the solution of Iodate of Potash previously mixed with a little mucilage of starch; and, if it gives rise to a blue colour, agitate the whole product of distillation with a quarter of an ounce of black Oxide of Manganese perfectly dry and in fine powder, and redistil. B. 1864. (Any Sulphuric acid present decomposes the Iodate, and disengages Iodine. The SO_2 is converted into SO_3 by the Manganese, with which it then combines.) The product is a tolerably pure hydrate of Acetic acid ($C_4H_3O_3, HO$). It tends to crystallise at all temperatures below 60°.

A colourless liquid with a pungent acetous odour, converted, when cooled to 34°, into colourless prismatic crystals. Sp. Gr. 1·065, which is increased by adding to the acid 10 per cent. of water. 60 *gr. by weight with* 1 *oz. of water require for neutralisation* 990 *measures of the volum. sol. of Soda*. It does not give rise to a blue colour, when added gradually to an equal volume of the solution of Iodate of Potash, previously mixed with a little mucilage of Starch.

Acidum Aceticum, B.—This is purified from the common acid obtained by the destructive distillation of wood. The impure Pyroligneous acid is formed into Acetate of Soda, as stated above; this is usually purified by several crystallisations; the product being distilled with Sulphuric acid, Acetic acid is condensed in the receiver, and Sulphate of Soda left behind; and finally, the acid may require one or more redistillations, to free it from empyreumatic matters, and reduce it to the proper density. It is a colourless liquid with a strong acid reaction, and odour of vinegar. Sp. Gr. 1·044. 182 *gr. by weight require for neutralisation* 1000 *measures of the volum. sol. of Soda*. It leaves no residue when evaporated; gives no precipitate with Sulphuretted Hydrogen, Chloride of Barium, or Nitrate of Silver, does not give off HS when heated with HCl and granulated Zinc; and does not give rise to a blue colour when added gradually to an equal volume of the solution of Iodate of Potash previously mixed with a little mucilage of Starch.

Acidum Aceticum dilutum, B. Dilute Acetic Acid.

Prep.—B. Mix *Acetic acid* Oj. with *Dist. water* Ovij.

The dilute acid of the B. P. has a Sp. Gr. of 1·006. Gr. 440 (f℥j.) is saturated by 313 measures of the volumetric solution of Soda, and it contains about 3·63 per cent. of real acid.

Action. Uses.—Though so many forms are officinal, Acetic acid is not proportionally useful. The strong acid is one of the quickest Vesicants known, and an excellent escharotic for warts and corns. Acetum or Vinegar has been used as a solvent for several vegetable principles, and is employed by the B. P. in making *Linimentum Cantharidis, Oxymel, Extractum Colchici Aceticum*, &c. It is an excellent and grateful Refrigerant when applied externally as a lotion, or for sponging the body; its vapour when inhaled is useful in various affections of the throat and larynx. It is sometimes given internally, as in *Syrupus Aceti*. (*Good Vinegar*, French by preference, f℥xj. to *pure Sugar* f℥xiv., diluted, is a grateful form.)

Acetic acid is recommended by some in Scarlatina and Measles. *Dose* of the diluted acid, ʒß–ʒiij. (*See* OXYMEL.)

CREASOTUM, B. Creasote. A product of the distillation of Wood Tar.

This substance was discovered by Reichenbach in 1830 with several other compounds of Carbon, Hydrogen, and Oxygen, among the products of the destructive distillation of wood. It is found in Tar, in Pyroligneous acid, in wood-smoke, and in other substances which no doubt owe to it some of their properties. When pure, it is colourless and transparent, fluid, limpid like a volatile oil, of a powerful smoky odour, and a pungent burning taste. Its Sp. Gr., according to the B. P., is 1·071. It is of high refractive power; when pure, unchanged by exposure to light; greatly expanded by heat; boils at 397°; burns with a sooty flame. It forms two compounds with water, one a Hydrate of 1 part of water to 10 of Creasote, and the other a solution of 1·25 parts of Creasote in 100 of water (*Phillips*). It is soluble in Alcohol, Ether, and Naphtha; in Acetic acid and in the alkaline solutions; but is neither acid nor alkaline. It is decomposed by Potassium, Nit′. and Sul′. Its most characteristic property is that of coagulating Albumen, and of preserving meat indefinitely; whence its name (from κρέας, *flesh*, and σώζω, *I preserve*).

Prep.—It is obtained from Heavy Oil of Tar, or Pyroxylic Oil, which is derived, along with Pyroligneous acid, from the distillation of wood. This oil, which contains a great number of substances, is carefully distilled. The first and most volatile part which comes over is rejected: it contains a liquid called Eupion. The second denser portion contains the Creasote; and as soon as a white crystalline material, called Paraffine, begins to come over, the distillation is stopped. The impure Creasote is separated from Acetic acid by agitating it with Carbonate of Potash, and redistilling, rejecting the first part that comes over. It is next freed from adherent Ammonia by shaking it with a solution of Phosphoric acid, and again distilling; Phosphate of Ammonia remains behind. It is now dissolved in a solution of caustic Potash, and separated from an insoluble oil which floats on the surface. The alkaline liquid is boiled, and becomes brown by the decomposition of some impurity. The Creasote is then separated by adding Sulphuric acid to neutralise the Potash. It may afterwards be purified by re-solution in Caustic Potash, again boiling, and again separating by acid: then finally washing with water, and distilling, separating the first portion, which contains water.

The formula of Creasote has not been well ascertained, but is supposed to be $C_{14}\,H_8\,O_2$. As it is so difficult in preparation, it is often replaced in commerce by impure *Carbolic acid*, a substance which strikingly resembles it in its properties, but which, when pure, is a crystalline solid of a definite constitution. *Carbolic acid* constitutes the acid portion of the Volatile oil which is obtained by the distillation of coal-tar. This Carbolic acid was supposed by Laurent and Gmelin to be really identical with Creasote, but Gorup-Besanez and Mr Crace Calvert have shown that the Creasote of Reichenbach is altogether distinct from that substance.

Tests.—B. Specific gravity 1·065. A slip of deal dipped into it, and afterwards into Hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue colour. Dropped on white filtering paper and exposed to a heat of 212° it leaves no translucent stain. The first test is characteristic of Creasote; the second detects the absence of oils.

Action. Uses.—Creasote, applied to the tongue, causes pain; on the skin, a burning sensation; and is fatal to small animals. It is useful in healing ulcers, and inducing a healthy action in cutaneous affections, in gangrene, and in scrofulous sores: given internally it acts as a sedative. It often gives great relief in toothache, and is extremely useful in allaying vomiting. (*Elliotson.*) The medicine should be well diluted, with at least ½oz. of water to 1 drop.

MISTURA CREASOTI, B. Creasote Mixture.

Prep.—B. Take of *Creasote*, ♏xvj.; *Glacial Acetic Acid*, ♏xvj.; *Spirit of Juniper*, fʒß; *Syrup*, f℥j.; *Distilled water*, f℥xv. Mix the Creasote with the Acetic acid, gradually add the Water, and lastly the Syrup and Spirit of Juniper.

Dose.—f℥j.–f℥ij.; each f℥j. containing ♏j. of Creasote.

UNGUENTUM CREASOTI, B. Creasote Ointment.

Prep.—B. Rub *Creasote* ʒj. with *Simple Ointment* ℥j.

VAPOR CREASOTI, B. Inhalation of Creasote.

Prep.—Take of *Creasote* ♏xij., *Boiling Water* f℥viij. Mix the Creasote and water in an apparatus so arranged that air may be made to pass through the solution, and may afterwards be inhaled.

Introduced in 1867. For use in some kinds of sore throat, irritation of bronchi or larynx, fœtid breath, gangrene of lung, &c.

ACIDUM CARBOLICUM, B. Carbolic Acid. *Phenic Acid.*

Carbolic acid ($C_{12}\,H_5O$, $H\,O$) was obtained from coal-tar by Laurent in 1846. When Tar, which is one of the products of the distillation of coal, is itself submitted to distillation, then come over—(1.) Water; (2.) "Light Oils," or hydrocarbons which float upon water; (3.) "Heavy Oils," or hydrocarbons which sink in water. If the light oils are submitted to fractional distillation, separating the products which come over at different temperatures, Carbolic acid combined with Potash will be contained in the liquid which distils at a heat between 320° and 392° F. The oils which float on the surface are removed, and the Carbolic acid separated from the potash by adding an acid and re-distilling. The product is still very impure and liquid, and can only be purified by a very complex process. Mr Crace Calvert prepares pure Carbolic acid by heating the Benzine of commerce with a weak alkaline solution. A blackish semi-fluid product is obtained, which contains 50 per cent. of Carbolic acid. The latter is separated by careful distillation. Mr Calvert mainains that the acid of Laurent was mixed with another compound, he Hydrate of Carbolic acid, or Phenic Alcohol. Pure Carbolic acid he states to be sol. in 20 parts of water; Laurent's in 33. The former melts at 41°, and boils at 182°; the latter melts at 34°, and boils at 186° (Centigrade Therm.)

Commercial Carbolic acid is an impure liquid which contains water, Cresyllic acid, and many other substances. The pure or cryst. acid only should be used in medicine. It is described as follows in the B. P. 1867, in which it was first introduced. "In colourless acicular crystals, which at a temperature of 95° become an oily liquid having a strong odour and taste, resembling those of Creasote, which it also resembles in many of its characters and properties. Its specific gravity is 1·065; boiling point, 370°. The crystals readily absorb moisture on exposure to the air, and they are thus liquefied; the acid, however, is but slightly soluble in water, but it is freely soluble in alcohol, ether, and glycerine. It does not redden blue Litmus paper. A slip of deal dipped into it, and afterwards into Hydrochloric acid, and then allowed to dry in the air, acquires a greenish-blue colour. It coagulates albumen. It does not affect the plane of polarisation of a ray of polarised light."

Action. Uses.—The medicinal and sanitary properties of Carbolic acid seems to depend on a remarkable power of preserving organic substances, preventing putrefaction, and arresting fermentation, which may or may not be due, as alleged, to its action in destroying the minute organisms which are the chief agents in decompositions of organic material. (Pasteur.) It is certainly an antiseptic of great value, and a solution is now often employed in keeping streets, mews, stables, and utensils of all kinds in a wholesome state. It is said to have done much good in the late cholera epidemic.

Dose.—Internally, gr.j.–gr. iij.; seldom used; but probably Tar owes a great part of its virtue to it. Used externally in skin diseases, especially those of a fungous origin; also to wounds, foul ulcers, and gangrenous sores. The following affords an excellent means of applying it:—

GLYCERINUM ACIDI CARBOLICI, B. Glycerine of Carbolic Acid.

Prep.—Take of *Carbolic Acid* ℥j., *Glycerine* f℥iv. Rub them together in a mortar until the acid is dissolved.

FOSSIL VEGETABLE PRODUCTS.

[PETROLEUM, L. Bitumen liquidum nigricans e terrâ sponte manans, L. Petroleum. Barbadoes Tar. Rock Oil.

Petroleum, as its name indicates, is an oil-like exudation from rocks, which has been employed in medicine from the earliest times, though little used now. It is very abundantly diffused, and found in other forms, as of Asphalte, Naphtha, &c.

Besides in Barbadoes and Trinidad, Petroleum is found floating on some springs of water in this country, as at Colebrook Dale, &c., also in many parts of Europe, and most extensively in North America. In Asia it is found at Baku, on the shores of the Caspian, and very abundantly at Ranan-goong, or Earth-oil Creek, on the banks of the Irrawaddy. Colonel Symes describes the wells as about 500 in number, and states that upwards of 400,000 hogsheads are annually taken away in boats. It may readily be obtained by digging into the sand in warm weather. This was examined by Drs Christison and Gregory, who found in it Paraffine and Eupion, which Reichenbach met with among the products of the destructive distillation of wood; whence they infer that Rangoon Petroleum is the product of the destructive distillation of vegetable matter, probably from subterraneous causes now in operation.

Petroleum has the consistence of treacle; a reddish-brown or black colour, with a bituminous taste; floats on water, in which it is insoluble; and burns with a dense black smoke, leaving a carbonaceous residuum. Acids, Alkalies, and Rectified Spirit have little effect on it; Ether and Volatile and Fixed Oils dissolve it. Exposed to the air, it hardens into Asphalte; if submitted to heat, a yellowish-coloured liquid distils over, which resembles the Naphtha obtained in making Coal-gas. It is used for illuminating purposes. The term Naphtha is also applied to the thinner and more transparent varieties of Rock-oil. These are all more or less pure Hydrocarbons, free from Oxygen, and therefore used for preserving Potassium and dissolving Caoutchouc.

Action. Uses.—Stimulant; has been recommended externally in Rheumatism and in Cutaneous affections; internally as a Vermifuge. The Rangoon is probably better than other kinds.]

SUCCINUM. Amber.

Amber (*ἤλεκτρον*), with its property of attracting light bodies, was known to the Greeks; also to the Arabs, being their *kah roba* (grass-attractor). The term Electricity has been derived from its Greek name. It is no doubt a fossil product, usually washed up by the sea in different parts of the world. This country is supplied chiefly from the Baltic, it being cast on shore between Königsberg and Memel. In India it is obtained both in Kutch and Assam. It is probably the resin of some Coniferous tree, as such wood is found in a fossil state. Insects and parts of plants are enclosed in amber found associated with Lignite beds. It is met with in irregular-shaped brittle pieces, of a yellowish or yellowish-red resinous appearance, translucent, devoid of taste and smell. It is not acted on by water or Alcohol. Subjected to distillation, it yields first a yellow liquid which contains Acetic acid, and afterwards a thin yellowish oil, with a yellow crystalline sublimate, which is Succinic acid ($C_8 H_4 O_6, 2\,H\,O$) This acid, which resembles the fatty acids, may be purified by pressure in bibulous paper, and redistillation.

Action. Uses.—Succinic acid has been supposed to be Expectorant. The Oil is Stimulant and Antispasmodic in doses of ♏v. It used to be an ingredient of Tinctura Ammoniæ Comp., or *Eau du Luce.*

ANIMAL MATERIA MEDICA.

The animal creation, so interesting and essential an object of study for acquiring a scientific knowledge of the anatomy and physiology of the human frame, has become less important as connected with Materia Medica since the progress of medicine has caused the disappearance from our books and practice of a crowd of inert and disgusting remedies, which could only have operated through the imagination; while modern chemistry has shown that others can be obtained more easily and as pure from the mineral or vegetable kingdom. Thus Corals, burnt Oyster-shells, and Crab-claws, were valuable on account of their being formed of Carbonate of Lime; burnt Bones on account of Animal Charcoal, and their ashes for Phosphate of Lime, yielded also by Cornu ustum; burnt Sponge for the salts of Iodine. Oils and fats in the animal kingdom are obtained of nearly the same nature essentially as vegetable oils and fats, as in the form of Lard or Suet. So Bees' Wax is like that of Palms and Myricas. Spermaceti contains a peculiar principle. These fatty matters continue to be retained, but chiefly as external applications. Saccharine matter is contained in Honey and in Milk. Gelatine is obtained from Isinglass, also from Hartshorn, and even from Bones; Albumen from the White of the Egg; and Caseine from Milk, which also contains Butter and Whey. The peculiar secretions called Musk and Castor are still considered to possess some power in controlling a few nervous affections. The only animals which are officinal in their entire state are the Cochineal, for its colouring matter, Cantharides for their vesicating properties, and the Leech to draw blood.

I. CYCLO-NEURA *v.* RADIATA.

Class PORIFERA, *Grant.*

SPONGIA OFFICINALIS, *Linn.* The Officinal Sponge.

Sponge is so well known for its economic uses that it does not require a detailed description. Numerous species are known with soft porous bodies, traversed by tortuous canals; but the officinal Sponge is imported from the Mediterranean and Red Seas. Some coarser kinds are obtained from the West Indies. Those of the British Seas would probably answer equally well for burning. When collected, Sponge contains numerous small fragments of corals and minute shells: from these it must be freed before it can be used for surgical purposes; for which it is well suited, from its soft and porous nature. Sponge *tents* are sometimes used for dilating sinuses. These are prepared by dipping strips of Sponge into wax, and as this melts by the heat of the body, the Sponge absorbs moisture, and swells; or pieces of Sponge may be tightly wound with thread, which can afterwards be cut. Sponge is composed of Gelatine and Coagulated Albumen. (*Hatchett.*) When burnt, its ashes consist of

Carbon, some Silex, Carbonate and Phosphate of Lime, Carbonate of Soda, Chloride and Iodide of Sodium, Bromide of Magnesium, and a little Oxide of Iron. On account of the Iodine which it contains, *Burnt Sponge* was formerly much used in Goïtre and Scrofulous affections. On the Continent some still prefer it to the preparations of Iodine. It is given in doses of ʒj. or more, along with honey.

Class POLYPIFERA, *Grant.* The skeletons of Polypiferous animals, so well known by the name of Coral, were long officinal, as they still are on the Continent and in the East. They owe their medical properties to Carbonate of Lime, with the addition of a little Oxide of Iron.

II. DIPLO-NEURA *v.* ARTICULATA.

Class ANNELIDA.

HIRUDO, B. Sanguisuga medicinalis, and Sanguisuga officinalis, *Savigny. Hirudo*, Cuv. The Leech. (Collected in Spain, France, Italy, and Hungary.)

Leeches and their effects must have been known from the earliest times. They were early employed therapeutically by the Hindoos, and the Arabs adopted their practice. (Royle, *Hindoo Med.* p. 38; and Wise on *Hindu Medicine*, p. 177.) Themison mentions the employment of Leeches by the ancients. Herodotus alludes to one kind (*Bdella nilotica*). Dr Pereira infers that *Sanguisuga ægyptiaca*, the species from which the French soldiers in Egypt suffered, is that referred to in the Bible (Prov. xxx. 15) by the name of *Olukeh* or *Aluka*. The latter, or *Aluk*, is also the Arabic name for Leech.

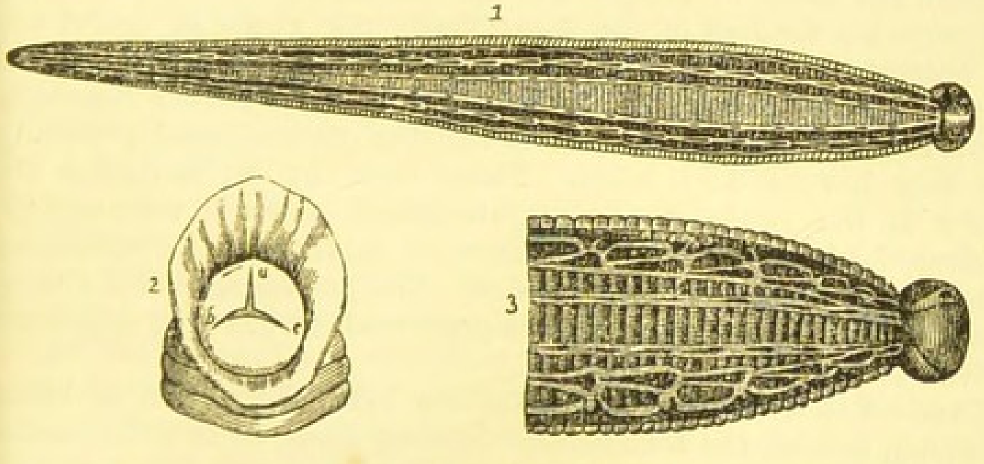

Fig. 110.

Leeches are included by Cuvier in the genus *Hirudo*. This has since been subdivided into several genera. Savigny calls that which includes the leeches used in medicine SANGUISUGA, the *Iatrabdella* of Blainville. Leeches are characterised by having an elongated, plano-convex body, tapering towards both extremities, wrinkled transversely, and composed of from 90 to 100 soft rings. The mouth is furnished with a lip, and the posterior extremity provided with a flattened disk, both adapted to fix upon bodies by suction, and to serve the leech as the principal organs of locomotion. Underneath the body two series of pores are observed, which lead to as many interior pouches, which are regarded as organs of respiration. The intestinal canal is straight, inflated from space to space, as far as two-thirds of its length, where there are two cæca. The blood swallowed is preserved there red and unchanged for many weeks. The subgenus *Sanguisuga* has the upper lip divided into several segments, the aperture of its mouth is tri-radiate, and it contains three jaws, each armed on its edge with two ranges of very fine teeth. Ten blackish points are observed on the head, which are taken for the eyes. The anus is small, and placed on the dorsal surface of the last ring.

The two species most commonly used, and which by some are considered varieties of one another, are the speckled Leech (*S. medicinalis*) and the green Leech (*Sanguisuga officinalis*).

S. MEDICINALIS (fig. 110 1 to 3), the kind usually employed here, is readily distinguished from the following by its belly, which is of a yellowish-green colour, but covered with black spots, which vary in number and size, forming almost the prevailing tint of the belly, the intervening spaces appearing like yellow spots. On the back are six longitudinal reddish or yellowish-red bands, spotted with black and placed on an olive-green or greenish-brown ground. The number of rings varies from 93 to 108. Teeth 79 to 90 in number. A native of almost all parts of Europe, often called the English, the speckled, the true, the brown Leech, &c.

S. OFFICINALIS is distinguished by its unspotted olive-green belly and by the dark-green back, along which and the flanks are observed six longitudinal, often interrupted, rusty-red stripes. Six of the eyes are said by Savigny to be very prominent. Teeth about 70 in number. A native of the south of Europe, as of France and Germany. It is usually called the Green Leech, sometimes the Hungary Leech, from being a native of that country.

(In the B. P. 1864 the names and descriptions of these two varieties were, by some accident, reversed.)

Other species are figured by Brandt, as *Hirudo provincialis*, *H. Verbana*, *H. obscura*, and *H. interrupta*. In the United States they use *H. decora*. In India, Leeches are extremely abundant, procurable both in the tanks of Bengal and in the North-West Provinces, as well as along the foot of the Himalayas. Six kinds of useful and six venomous Leeches are mentioned in Susruta and by Avicenna, *l. c.* Leeches are now mostly imported into this country from Hamburg. Many attempts have been made to rear the officinal Leech artifically, but they have mostly failed. Those made by M. Soubeiran and others in the ponds in the neighbourhood of Paris were entirely frustrated by the *Oniscus aquaticus*, a small aquatic crustacean, which preys upon the young leeches. The putrefaction of the water in which leeches are kept may be prevented by allowing fragments of Iron to remain in it.

Uses.—Leeches are effectual for the local abstraction of blood, affording, indeed, the best method in many cases, as in inflammation of the abdomen, scrotum, in hæmorrhoidal tumours, and prolapsus of the rectum. They may often follow general depletion; but according to the quantity or the nature of the case, will themselves produce constitutional effects, especially in the cases of children. They act by a sawing motion, and draw each about ʒjß of blood, though f℥ß may be obtained by fomentation, &c. Excess of bleeding may be stopped by pressure or the application of Matico; sometimes caustic is required, or even sewing up the wounds with a fine needle.

Class INSECTA. Order *Coleoptera.*

CANTHARIS, B. Cantharis vesicatoria, *De Geer.* Cantharides. *Lytta.* The Blister Beetle. The Beetle, dried. (Collected chiefly in Hungary), B. *Spanish Flies.*

The name κάνθαρις was applied by the Greeks to a species of Coleopterous Insect which possessed the properties of the officinal Blistering Beetle, but it was distinguished by *yellow* transverse bands. This is the characteristic of the species of Mylabris, one of which, *M. Fusseleni*, occurs in the south of Europe, and another, *M. Cichorii* (fig. 111, 2), in Syria, and apparently throughout the East. In India it is called *telee* and *telee mukhee*, or the Oily Fly, no doubt from the oil-like exudation which the insects of this genus give out from the articulations of their legs when seized. Another species, *M. Trianthemæ*, is mentioned by Dr Fleming, and the *Lytta gigas*, Fab., is found there as well as in Senegal. One is mentioned by the Arabs under the name of *zurareh.* It is not known when the officinal Blistering Fly came to be used, but it has had a variety of names. It was called *Meloe vesicatorius* by Linnæus, *Lytta vesicatoria* by Fabricius, and *Cantharis vesicatoria* by Geoffroy, a name adopted by the Pharmacopœias. Geoffroy grouped the Vesicatory Beetles in a small tribe corresponding nearly with the Linnæan genus Meloe, and distinguished it by the title Cantharideæ. This he divided into eleven genera, among which are the *Cantharis, Mylabris*, and *Meloe*, species of all of which have been employed as vesicatories. *Meloe majalis*, or Mayworm, is figured at fig. 111, 1, as a specimen of the genus.

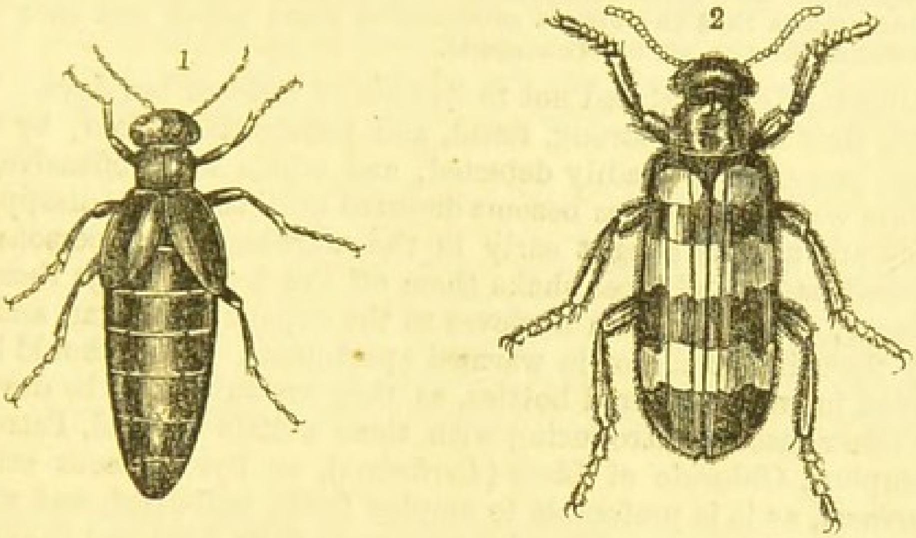

Fig. 111.

Cantharis vesicatoria (fig. 112, 1 and 2) is of an elongated, almost cylindrical form, from 6 to 10 lines in length by about 2 in breadth, the male somewhat smaller than the female. It is easily distinguished by its two beautiful elytra or wing-cases, which are long and flexible, and of a shining golden-green colour, and cover two thin brownish membranous wings. The head is large and subcordate, with a longitudinal furrow along the head and the throax: this is not larger than the head, rather quadrate. Its thorax chiefly, but also the rest of the body, is covered with whitish-grey hairs; antennæ black, long, simple, filiform. The maxillæ support the jointed palpæ, of which the terminal joint is somewhat ovate. The legs are from 4 to 6 lines long, smooth, 5 joints to the first pair of the tarsi, and 4 only to the last, all violaceous. Single spine on leg and notch in tarsus. The last joint of tarsus with a pair of claws, each of which is bifid. Near the anus of the female are two articulated caudal appendages, somewhat similar to palpi.—It abounds in the south of France, Spain, and Italy; and it has spread into Germany and the south of Russia. It is found upon the Ash, Lilac, and Privet especially, but also upon Elder and Honeysuckle, and more rarely on the Plum tree, Rose, Willow, and Elm. M. Farines states that the insects produced in warm places, and such as are exposed to the sun, are most energetic.

Cantharides are stated not to live above eight or ten days. When alive, they exhale a strong, fœtid, and penetrating odour, by which their presence is readily detected, and which is so offensive, that public walks sometimes become deserted until they have disappeared. They are usually caught early in the morning, when persons with covered hands and faces shake them off the trees, plunge them into vinegar, or expose them in sieves to the vapour of vinegar, and then dry them in the sun or in warmed apartments. They should be preserved in well-stoppered bottles, as they are subject to be destroyed by other insects, introducing with them a little Alcohol, Petroleum, Camphor, Chloride of Lime (*Derheims*), or Pyroligneous acid (*M. Farines*), as it is preferable to employ fresh, well-dried, and smooth, —not dusty insects. They long preserve their form and colour, also to some extent the disagreeable odour of the living insect, and have an acrid burning taste. The powder is of a greyish-brown colour, interspersed with shining particles, which are the fragments of the elytra, head, and feet: though comparatively inert, these parts are very indestructible, and we are often enabled to detect their presence in cases of poisoning.

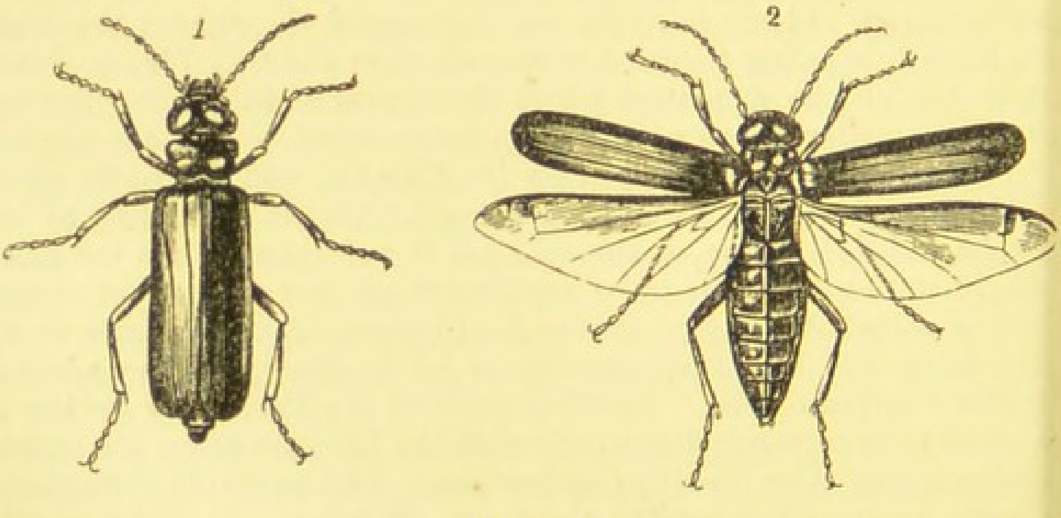

Fig. 112.

These beetles are not now obtained from Spain, but collected chiefly in Hungary, also in Russia and Sicily.

Cantharides have been analysed by Robiquet, and found to contain a *Green Oil*, a *Fatty Matter*, *Osmazome*, free *Acetic* and *Uric acids* and *Phosphates of Lime* and *Magnesia*,—with an active principle, called *Cantharidine.* This is intermediate in nature between volatile oils and resins. It crystallises in white shining plates, fuses into a yellow oil, and is volatilised by a higher temperature. It is soluble in ether, and in strong acids and alkalies. When isolated, it is insoluble in water and cold spirit ; but these menstrua are enabled to dissolve it out of Cantharides by the aid of some other principles in the flies. Robiquet found that $\frac{1}{100}$th of a grain produced painful blistering of the surface. It volatilises slowly even at low temperatures, and powerfully irritates the eyes of those who experiment upon it. Analysed by Regnault, Cantharidine gave the formula $C_{10}\ H_6\ O_4$.

Action. Uses.—Acrid Poison ; Rubefacient and Irritant ; Stimulant Diuretic ; sometimes producing inflammation of the Urinary organs ; but useful in smaller doses in inducing a healthy state of the mucous membrane in Chronic Gonorrhœa, Leucorrhœa, &c. Best known and most extensively employed for raising Blisters when applied to the skin, which it does in a space of from six to twelve hours, though sometimes with the disadvantage of producing painful Strangury.

TINCTURA CANTHARIDIS, B. Tincture of Cantharides.

Prep—B. *Cantharides*, in coarse powder, ℥¼ ; *Proof Spirit*, Oj. Seven days. Make up to Oj. (Same strength as L. P.)

Action. Uses.—Stimulant Diuretic.

Dose.—♏x., but cautiously increased—fʒj. with some demulcent. Used internally in Gleet, Leucorrhœa, incontinence of Urine. With Soap or Camphor Liniment used as a Rubefacient in Rheumatism, &c.

ACETUM CANTHARIDIS, B. Vinegar of Cantharides.

Prep.—Take of *Cantharides*, in powder, ℥ij. ; *Glacial Acetic acid*, f℥ij. ; *Acetic acid*, f℥xviij., or a sufficiency. Mix f℥xiij. of the Acetic acid with the Glacial Acetic acid, and digest the Cantharides in this mixture for two hours at a temperature of 200° ; then transfer the ingredients, after they have cooled, to a percolator, and when the liquid ceases to pass pour f℥v. of Acetic acid over the residuum in the apparatus. As soon as the percolation is complete. subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient Acetic acid to make one pint.

Restored in 1867 from L. P.

Rather stronger than the *Acetum Cantharidis* of the L. P. Less active than E. and D. A liquid blister, which is to be painted on the skin with a camel's-hair brush, and, when dry, repeated once or twice, according to circumstances.

LIQUOR EPISPASTICUS, B. Blistering Liquid. Linimentum Cantharidis, B. (1864.) Liniment of Cantharides.

Prep.—B. Take of *Cantharides*, in powder, ℥viij. ; *Acetic acid*, f℥iv. ; *Ether*, Oj. Macerate the Catharides in the Acetic acid ; then, in a percolator, for twenty-four hours, allow the Ether to pass slowly through till twenty fluid ounces are obtained. Keep it in a stoppered bottle.

This preparation has some resemblance to the *Acetum*, but is four times as strong, and, from the rapid evaporation of the Ether which forms the bulk of the liquid, it will quickly produce a blister when painted on the skin. Ether was first recommended as a solvent of Cartharidine by Dr Ættinger of Bavaria. Besides the active principle, it takes up some oil and resin. Dr Ættinger used Ether alone to prepare his blistering liniment (2 parts to 1 of flies). Mr Proctor finds Chloroform to be a still better solvent of Cantharidine than Ether.

Unguentum Cantharidis, B. Ointment of Cantharides.

Prep.—B. Take of *Cantharides*, ℥j.; *Yellow Wax*, ℥j.; *Olive Oil*, f℥vj. Infuse the Cantharides in the Oil, in a covered vessel for twelve hours, then place the vessel in a water bath at 212° for fifteen minutes, strain through muslin with strong pressure. add the product to the Wax previously melted, and stir constantly while the mixture cools.

Olive Oil is a good solvent for the active principle of Cantharides, and may be used by itself to form with it a rubefacient liniment. The ointment may be used as a counter-irritant, and to keep open blisters.

Emplastrum Cantharidis, B. Blister Plaster.

Prep.—B. Liquefy together *Prepared Lard*, ℥vj.; *Yellow Wax and Prepared Suet*, āā ℥vijß, by a water bath; and add *Resin*, ℥iij., previously melted; then introduce *Cantharides*, in powder, ℥xij. Mix thoroughly, and stir until cool.

One part in three of Cantharides. (This is identical with the plaster of the L. P.)

Action. Uses.—Vesicant: the most commonly employed application for raising blisters. In some cases the skin requires to be previously stimulated with an Embrocation or Sinapism, but generally the action is certain and complete.

Emplastrum Calefaciens, B. Warm or Rubefacient Plaster.

Prep.—B. Take of *Cantharides*, in coarse powder, ℥iv.; *Boiling water*, Oj.; *Expressed Oil of Nutmeg*, ℥iv.; *Yellow Wax*, ℥iv.; *Resin*, ℥iv.; *Soap Plaster*, ℔iij¼; *Resin Plaster*, ℔ij. Infuse the Cantharides in the boiling Water for six hours; squeeze strongly through calico, and evaporate the expressed liquid by a water bath till reduced to one-third. Then add the other ingredients, and melt in a water bath, stirring well until the whole is thoroughly mixed.

Used as a stimulant application to tumours and indolent sores.

Several substances have of late years been introduced as substitutes for Blistering Plaster, which are both elegant and efficient, under the names of *Tela vesicatoria*, *Blistering Tissue*, &c., of which other forms are the Parisian *Taffetas vesicant*, *Papier et Taffetas epispastique.* (*See* Soubeiran, ii. p. 210.) They are made with an ethereal or alcoholic Extract of Cantharides or solution of Cantharidine, mixed with resin or wax, and spread in a very fine layer upon these tissues, previously oiled or waxed.

B. P. 1867 introduces the following formula :—

CHARTA EPISPASTICA, B. Blistering Paper.

Prep.—Take of *White Wax*, ℥iv. ; *Spermaceti*, ℥jß ; *Olive Oil*, f℥ij. ; *Resin*, ℥¾ ; *Canada Balsam*, ℥¼ ; *Cantharides*, in powder, ℥j. ; *Distilled water*, f℥vj. Digest all the ingredients, excepting the Canada Balsam, in a water bath for two hours stirring them constantly, then strain, and separate the plaster from the watery liquid. Mix the Canada Balsam with the plaster melted in a shallow vessel, and pass strips of paper over the surface of the hot liquid, so that one surface of the paper shall receive a thin coating of plaster.

It may be convenient to employ paper ruled so as to indicate divisions, each of which is one square inch.

Æther Cantharidalis, or the Liniment (above), mixed with an equal part of *Collodion*, forms an admirable drying blister for parts of the body where a more fluid application would be liable to run off. (Rapp.)

Order *Hemiptera*.

COCCUS, B. Coccus Cacti, *Linn.* The female insect, dried. Cochineal. (Reared in Mexico and Teneriffe.)

Cochineal, so valuable as a dye, is of little importance in medicine. Several of the genus are used as dyes, as the Kermes insect, or *Coccus Ilicis*, found on the Ilex Oak ; the *Coccus Lacca*, or Lac insect, found on various trees and shrubs in India, much used as a substitute for Cochineal, its Resin (Shell-Lac) being also employed for various purposes ; and the *Coccus polonicus*, found on the roots of *Scleranthus perennis.* Something similar is found on the roots of a plant in the marshes of Herat. (*Burnes.*) The true Cochineal or *grana fina* of the Spaniards, is found in the cool parts of Mexico, as near Oaxaca, whence one kind of Elemi is obtained. The *Grana sylvestre*, an inferior species, is found in hot parts, as near Vera Cruz, and in Brazil. The female of the Cochineal insect is alone collected from off the Cactus plant, where the impregnated females have previously been placed by the natives of Mexico to produce their numerous young. These, when matured, are brushed off, and killed by artificial heat. Three harvests are annually collected. The *Silver* and *Black* varieties of the *Grana fina* are known. Cochineal is also obtained from Honduras, and has lately been introduced into the Canary Islands, where it is now extensively cultivated. (See account by Martius, in P. J. xiv. 553.) The insects are oblong, roundish, plano-convex, from one to two lines in length, wrinkled, the *silver* kind of a colour resembling silver paper, owing to a fine down with which they are covered, and by which the genuine may be distinguished from any imitation of the colour with powdered Talc, &c. They are of a purplish-grey colour, while the *black* variety is without bloom, and of a dark-reddish colour. An inferior kind (granilla), made up of smaller insects, and broken fragments, is also sold. Cochineal, when powdered, is of a carmine colour, without odour, but having a slightly bitter taste. It contains some fatty matter, with a brilliant colouring principle, which has been called

Carminic acid, and makes it valuable as a dye. It is used for giving colour to some tinctures.

TINCTURA COCCI, B. Tincture of Cochineal.

Prep.—Macerate for seven days *Cochineal*, in powder ℥ijß, in *Proof Spirit* Oj. in a closed vessel, with occasional agitation. Strain, express, and filter. Add Proof Sp. to make Oj.

Used as a colouring ingredient.

[SYRUPUS COCCI, L. Syrup of Cochineal.

Prep.—Boil bruised *Cochineal* gr. lxxx. in *boiling Dist. water* Oj. for fifteen minutes in a covered vessel, frequently stirring. Strain, and complete as with *Syrup. Althææ*, adding *Sugar* ℔iij. and *Rect. Spirit* f℥ijß, or q. s.

Intended as a colouring addition to draughts and mixtures.]

Order *Hymenoptera, Linn.*

APIS MELLIFICA, Linn. The Honey-Bee is officinal only on account of the Honey and Wax which it secrets or stores up.

MEL, B. A Saccharine secretion deposited by the hive-bee in the honey-comb. Honey.

Honey is secreted by the nectaries of flowers, and sucked by the Bee into its crop, where it undergoes some slight changes, and is then stored up in the comb. The finest Honey is that which is allowed to drain from thence; and, if obtained from hives which have never swarmed, it is called Virgin Honey. It partakes of the properties of the plants from which the bees have collected it. When of fine quality it is liquid and viscid, but translucent, having a fine, though peculiar odour, and a very sweet taste; but the best appears to some people slightly acrid, from an uneasiness experienced in the fauces. After a time honey becomes thick, white, and granular in texture. Inferior qualities are of a reddish-brown colour, granular, and intermixed with impurities, and are usually obtained by pressure of the comb. Honey is soluble in water, and a great part is taken up by boiling Alcohol. It is composed of crystallisable with some uncrystallisable Sugar, a small proportion of Mannite, and a little aromatic principle. The inferior qualities contain Wax, some acid matter, and impurities. Diluted with water, it undergoes the Vinous fermentation, and Hydromel, or Mead, is produced. Honey, if boiled in water for five minutes, and allowed to cool, does not become blue with Tincture of Iodine. (B.) This test is to guard against adulteration with starch or flour.

MEL DEPURATUM, B. Clarified Honey.

Prep.—Melt Honey in a water bath, and strain while hot through flannel.

Action. Uses.—Demulcent and slightly laxative. Chiefly used in gargles, &c. It is a constituent of Oxymel, and of the Mel Boracis.

Oxymel, B.

Prep.—B. Melt *Clarified Honey* ℥xl. and mix with it *Acetic acid* and *Dist. water* āā ℥v.

Action. Uses.—Expectorant and Diaphoretic.

Dose.—ʒj.-℥ß given in conjunction with other cough medicines. It was used by the L. P. to make *Oxymel Scillæ.*

Cera flava, B. Yellow Wax. The prepared Honeycomb.

Cera alba, B. White Wax. Bleached Bees' Wax.

Wax, like Honey, has been known and employed from very ancient times. It is secreted in considerable quantities by various plants, as the Palms; by species of *Myrica*, especially at the Cape of Good Hope; and by less known plants in China and Japan. It used to be supposed that the Bee merely conveyed it from the plant; but it is now known that it is secreted by the Bee in glands situated on its abdominal scales, and thence collected by it for the construction of its cells.

Cera flava.—Yellow or Common Wax, is obtained by subjecting the comb to division and expression to separate Honey, melting the residue in boiling water, and keeping it hot for some time, to allow the impurities to separate or be dissolved. On cooling, the Wax concretes. It is melted again, and then strained, and sold in cakes. It is of a dull yellow colour, and has a peculiar, somewhat agreeable odour. By making it fall in a melted state, in small streams, upon a revolving wetted cylinder, it concretes in thin ribbon-like layers, which being exposed for some time to the united influence of light, air, and moisture, become bleached, and of a yellowish-white colour.

This is Cera alba. Spermaceti is often mixed with it to improve its colour; and Starch, Tallow, &c., occur as adulterations. Wax is firm in consistence, but melts at 155°; it burns with a bright light. It may be dissolved in boiling Alcohol and in Ether, but very readily in the Fixed and Volatile Oils. Resin and fat unite with it, and imperfect soaps are formed by its union with alkaline solutions. Dr John found it to be composed of two principles, *Cerin* and *Myricin.* The former is separated by its solubility in Alcohol. Mr Brodie has shown that this *Cerin* consists of a substance belonging to the chain of fatty acids, and called *Cerotic acid* ($C_{54} H_{54} O_4$). *Myricin* is a more complex body. It consists of *Palmitic acid* ($C_{32} H_{32} O_4$) in combination with *Melissic Alcohol*, the hydrated oxide of a peculiar organic radicle, *Melissyle* ($C_{60} H_{61}$).

Wax may be adulterated with Stearine and other fatty bodies. Starch may be used to whiten it. The B. P. gives as tests:—It is "not unctuous to the touch; does not melt under 140° (or, *white wax*, under 150°), yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine. Boiling water in which it has been agitated, when cooled, is not rendered blue by iodine."

Action. Uses.—Demulcent: made into an emulsion, it is sometimes useful in sheathing abraded and irritable surfaces, as in Catarrh and Chronic Dysentery; but its chief value is for external application in the various forms of Cerates, Ointments, and Plasters.

Ceratum of the L. P. was an ointment made of White Wax and Olive Oil (℥xx. and Oj.)

Unguentum simplex, B. Simple Ointment.

Prep.—Melt *White Wax* ℥ij. and *Prepared Lard* ℥iij. in *Almond Oil* ℥iij. on a water bath. Remove the mixture, and stir constantly while it cools.

Action. Uses.—A good simple dressing for sores. Used also as a basis for other ointments.

III. Mollusca.

Class Conchifera, *Lamarck.*

Ostrea Edulis, *Linn.* Testæ. The Shells of Oysters.

Oysters are well known as articles of diet. Immense quantities are dredged up on the coast of Kent, near Whitstable, and also on the opposite coast of Essex. The Shells were until lately officinal on account of the Carbonate of Lime of which they are composed, with a small portion of the Phosphate, and a trace of animal matter.

Testæ preparatæ, prepared Oyster-shells, have been used as Ant-acid; but differ only from chalk in containing some Phosphate of Lime and various impurities.

IV. Spini-Cerebrata, *v.* Vertebrata.

Class Pisces.

Icthyocolla, (B. Appendix.) Isinglass. Swimming bladder or sound of various species of sturgeon, Acipenser, *Linn.*, prepared and cut into fine shreds.

The name is derived from ἰχθὺς, a fish, and κόλλα, glue, and is translated Isinglass, a word derived from the German *Hausenblase*, from *hausen*, the great sturgeon, and *blase*, a bladder, being one of the coats of the swimming-bladder of Fishes, chiefly of the genus Acipenser or Sturgeon, and of which the best qualities are imported from the rivers of Russia, flowing into the Black and Caspian Seas as well as from the Sea of Aral, and the Lake of Baikal. Isinglass is also imported from Brazil, and likewise from India. Of late the quality of this has been much improved. Isinglass is the purest known form of Animal Jelly; and it is therefore as Gelatine that it is valuable. Gelatine, when pure, is transparent, and nearly colourless, devoid of both taste and smell, easily preserved when in a dry state, but soon putrefying when moist. It is soluble in the different dilute acids, as well as in the fixed alkalies. Its solution forms with Tannin a copious precipitate, which smells like tanned leather. As Corrosive Sublimate does not precipitate Gelatine, it serves to distinguish it when in solution from Albumen. Gelatine unites with a large proportion of water, and a strong solution on cooling becomes a solid tremulous mass. By boiling with Sul′, it may be converted into a kind of Sugar, called *Glycocoll.* Isinglass in its purest form is white, semi-transparent, devoid of smell or taste, softening in cold water, and dissolving in boiling water, with the exception of minute portions of earthy impurities. Bengal Isinglass, analysed by Mr E. Solly, yielded, in three specimens respectively, 86·5, 90·9, and 92·8 per cent. of Gelatine. For the sources of Isinglass, *see* Brandt and Ratzeburg's Medicinische Zoologie, Pereira's Elements of Materia Medica, and Dr Royle's Pamphlet on the Production of Isinglass along the coasts of India, 1842.

Action. Uses.—Demulcent. Used chiefly as a nutritious and non-irritating article of diet for the sick. Used also as a test, being equivalent to Gelatine.

OLEUM MORRHUÆ, B. Gadus Morrhua, *Linn.* Oil extracted from the fresh liver of the Cod (by the application of a heat not exceeding 180°.) *Oleum jecoris Aselli.* Cod-liver Oil.

Though some fishes contain Oil generally diffused throughout their substance, in the Cod tribe it is mainly confined to the substance of the liver. The Oil obtained from the liver of the common Cod (the *Asellus* of Pliny, and of some modern naturalists) has long been in use as a popular remedy in Sweden and other parts of Northern Europe. In 1782 it was strongly recommended in England by Dr Percival, as a remedy for chronic rheumatism; but it is only recently that it has been so extensively employed in scrofulous and consumptive cases as to necessitate its formal introduction into the Pharmacopœias. The livers of some other fishes, nearly related to the Cod, as the Dorse, Burbot, and Ling, are supposed to yield a small part of the Cod oil of commerce. This mostly comes from the coast of Newfoundland, where Cod-fish are so abundant.[*]

Prep.—There are several modes of extracting the oil. The best and finest oil is obtained by a process in which the cod-livers are neither exposed for such a time as to allow them to putrefy, nor subjected to a heat sufficient to decompose the oil or animal matter. Expression in the cold procures an oil, which, if afterwards clarified, is the best that can be obtained. The B. P. provides that the oil shall be extracted from the *fresh* liver, "by a heat not exceeding 180.°" This is the method which for some time has been adopted by the Messrs Bell. The fresh livers being sorted, and the best selected and cleaned, they are sliced, and exposed to this heat, until all the oil has drained from them. This is filtered and cooled to a temperature below 50° to congeal the more solid fat (*Margarine*), then again filtered, and kept in closed jars.

Inferior and coarser kinds of oil are prepared on the coast of Newfoundland and Norway by rougher processes. Sometimes a number of tubs are bored with holes at the bottom, and a layer of fir-twigs placed above them inside. The livers being then removed from the fish, are piled in the tubs upon the twigs, and allowed to remain there for a considerable time, exposed to the sun and air. The substance of the livers gradually putrefies, allowing the oil to

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[*] Shark-liver Oil has been lately imported into Liverpool. It agrees with the oil of Cod-liver in many of its chemical reactions, but is distinguished from it by its low specific gravity, which is ·866. It is thought to be the lightest fixed oil known. Sperm Oil is perhaps the next lightest; its sp. gr. is ·875. The Shark-liver Oil is obtained by the skippers from Sharks caught on the coast of Africa. Some also comes from Malabar.

run out through the twigs into vessels placed below to receive it. Oil obtained in this way, unless afterwards purified, is apt to be brown, rancid, and nauseous.

Another mode of extraction consists in boiling the livers in an iron pot, and separating the oil by filtration and expression through a cloth. This plan is said to be adopted by the fishermen at Newhaven in Scotland. If water be not added, or the operation performed carelessly, the product may contain empyreumatic matters produced by the heat employed.

De Jongh describes three kinds of oil as found on the Continent. They also occur in English commerce. They differ in colour, being *Pale yellow*, *Pale brown*, and *Dark brown*. They have all a peculiar odour, a sub-acrid fishy taste, a feeble acid reaction, and sp. gr. about ·924. Cold Alcohol dissolves from 2–3 per cent. of the Oil; hot Alcohol from 3–7 per cent.; it is soluble in ether in all proportions. The *Dark brown* oil is more impure than the other kinds; its odour and taste are disagreeable and empyreumatic; and its sp. gr. may be as high as ·929. De Jongh has analysed these three kinds with great care, but he does not find them to differ materially in composition. In 100 parts of Pale Oil, he found the following constituents:—*Oleic acid*, along with a peculiar principle called *Gaduine*, 74; *Margaric acid*, 11·75; *Glycerine*, 10·17; *Butyric acid*, ·07; *Acetic acid*, ·04; various principles contained in *Bile*, about ·32; *Iodine*, ·037; *Chlorine* and *Bromine*, ·148; *Phosphorus*, ·021; with *Phosphoric* and *Sulphuric* acids, *Lime*, *Magnesia*, and *Soda*, each in small quantity, the *loss* being 3. The Brown Oil contains less Oleic acid (69) than the above quantity. *Gaduine* has been analysed by De Jongh, but was considered by Berzelius to be probably a modification of *Bili-fulvic acid*, one of the principles of Bile. Others have ascribed its presence to the decomposition of the oil, it being contained in larger quantity in the Brown Oil. The B. P. describes Cod-liver Oil as "pale yellow."

According to the above results, Cod oil would differ but little from many other oils, except in containing biliary matters. But the researches of Dr Winckler seem calculated to throw much additional light upon its chemical constitution. He states that Cod-liver Oil does not contain any true Glycerine, but, instead of it, an analogous substance called *Propyline*, or oxide of *Propyle*. When the oil is saponified with oxide of lead, this Propyline is oxidised into a peculiar strong-smelling substance, *Propylic acid*, which forms a salt with the lead. Or if this oil be heated in a retort, with Potash, Lime, and Sal Ammoniac, a volatile liquid, *Propylamine* (NH_2, C_6H_7), quite colourless, and with a strong, herring-like odour, may be distilled over. These results are not to be obtained with any other officinal oil. (Buchner's *Repertorium*, 1852.)

Tests.—Though there are several tests which have been supposed to distinguish this oil, they are none of them very satisfactory. Many of its characters are common to all animal oils; and it is not clear that the late discovery of Winckler applies to this oil only. The biliary matters mark it as a liver oil. And it is supposed by some to be peculiar in the proportion of Iodine it contains. Seal oil and Whale oil are sometimes substituted for it. Biliary matters, as ox-gall, have even been mixed with these to render the factitious sample more perfect. A mixture of Iodine with Olive Oil has been prescribed in France instead of the Cod oil.

(1.) The first class of tests comprises those that determine it to be an *Animal Oil.* Its odour and taste, the considerable amount of ash left on incineration, and the Propylamine test of Winckler, will prove this. Or if Cod oil be mixed with strong Sulph. acid, the purple mass treated with excess of caustic potash, and heated, a penetrating odour of the Oil of Rue will be disengaged. This *Oil of Rue* ($C_{20}\,H_{20}\,O_2$) may be formed by the abstraction of 2 equiv. of oxygen from *Capric acid*, a volatile fatty acid supposed to exist in all animal oils. (R. Wagner.)

(2.) We may again prove it to be a *Fish Oil.* Mr Crace Calvert has discovered two tests which distinguish fish oils (as Sperm, Seal, and Cod-liver Oils) from all other oils, whether animal or vegetable. Soda and Phosphoric acid are the re-agents employed. If five volumes of the oil are mixed with one of a solution of Caustic Soda of sp. gr. 1·34, and heated to ebullition, a dark-red colour is produced. This will detect one per cent. of Fish Oil in any other Oil. In the second place, 1 part of strong Phosphoric acid with 5 of Oil forms a dark-red mixture which rapidly becomes black. This is said to detect 1 part of Fish Oil in 1000 of any other Oil. (P. J. xiii. 356).

(3.) The next test is an indication of the presence of *Biliary matters.* Some strong Sulphuric acid being mixed with some of the oil placed on a white porcelain slab, a rich violet colour is produced, which passes into a brown. This result does not depend upon the small quantity of Iodine present, as was once supposed, but is caused by *Cholic acid*, and other constituents of the bile of the fish. It shows it to be a *liver oil.* Sperm Oil and Seal Oil become red with this test.

(4.) The presence of *Iodine* (not in a free state, but combined with fatty matters) is thought to be of importance. It exists also in the oils of other fishes, and of cetaceans. If free Iodine can be dissolved out by shaking the oil with Alcohol, or discovered by the starch test, it must have been added fraudulently. The Iodine naturally present cannot be detected by ordinary means. De Jongh recommends to saponify the oil, to separate the soap, carbonise it, and test the ash for Iodine. Rabourdin mixes 1 part of potash with 10 of oil, burns the soap produced, triturates the ash with water, and adds to the clear solution an excess of mixed Sulph. and Nit. acids. This being then shaken up with Chloroform, the latter dissolves out all the Iodine, and becomes of a violet colour. By comparing its colour with that of another chloroform solution, containing a known proportion of Iodine, the quantity of Iodine in the oil is easily ascertained.

It is evident that none of these tests can be depended upon to detect partial adulteration with other oils. Perhaps the amount of

Propylamine that may be distilled over from the mixture of the Oil with Ammonia may furnish us with a quantitative test for this purpose.

Probably all genuine samples of the oil have about the same medicinal value. The purest kind—*i.e.*, that which is pale in colour, and has little odour or taste—is preferable as being most agreeable to the patient. It would seem from Dr De Jongh's experiments on his patients that he found the dark oil of most use as a medicine. But he now inconsistently recommends the light-brown oil as by far the best. The colour of darker specimens may be removed by animal charcoal, and Sir J. Murray proposes to remove the disagreeable odour by means of Carb. acid gas brought into contact with the oil under high pressure.

Action. Uses.—It has been supposed that the operation of this oil depends upon the presence of Iodine. This is probably an error. It cannot be replaced with advantage by any preparation of Iodine; nor has any other oil—whether given alone, or mixed with Iodine or Ox-gall—been extensively approved as a substitute, though many such trials have been made. It has been used in many cases of chronic disease, when attended with impairment of the nutritive functions. Thus it often proves useful in Skin diseases, in chronic Rheumatic and Gouty cases, in Scrofulous atrophy and affections of the bones and joints. In such disorders its use should be persevered in for some time. It has been found very serviceable in Pulmonary consumption, especially in the incipient stage, though it is also prescribed in advanced cases. In all of these disorders it is most appropriate when there is marked emaciation, and its beneficial result is shown by the fattening of the patient, by a slow alterative action, and improvement of the general health.

Dose.—fʒij.–f℥j. or ℥ij. three times a-day. To overcome the nausea which is sometimes experienced, the purer and pale oils, which have a less disagreeable taste, should be preferred to other kinds. It may be floated on milk, some aromatic water, a bitter infusion, the juice of an orange, cold tea, or coffee, or wine, according to the case and taste of the patient. It is generally advisable to persevere in its use for a considerable time.

The Iodides of Iron, Mercury, and Quinia, are soluble to a considerable extent in Cod-liver Oil, and may often be advantageously prescribed in conjunction with this menstruum in strumous cases requiring active alterative treatment. The alkaloid Quinia may be given in the same manner.

Class AVES.

GALLUS BANKIVA, *var.* domesticus, *Temminck.* (*Phasianus Gallus,* Linn.) Ovum. Egg of the Domestic Hen. Albumen Ovi, B. White of Egg. Albumen of Egg. Ovi Vitellus, B. Yolk of Egg.

The common Fowl, domesticated everywhere, is probably derived from the Jungle Fowl of India. Its Egg is well known as a highly esteemed article of diet. The shell, consisting almost entirely of Carbonate of Lime, is seldom now employed. Within the shell there is a white semi-opaque albuminous membrane, which contains the White of Egg, or *Albumen Ovi*, a glairy, viscid fluid, contained in very delicate membranous cells. The liquid may be considered a solution of Albumen, as it consists of 12 per cent. of this principle, with 85 of water, 2·7 of Mucus or uncoagulable matter, and 0·3 of saline substances, including Soda and traces of Sulphur. The glairy liquid is miscible with water, coagulated by heat under 212°, as in boiling an egg—also by acids. It then becomes white, opaque, and insoluble. The white of Egg is precipitated by Corrosive Sublimate, Subacetate of Lead, Prochloride of Tin, Tannin, &c.

The Yolk or Yelk, *Vitellus Ovi*, is a thick oily fluid, opaque, and yellow in colour, without odour, but with a bland and pleasant taste, forming a milky emulsion when agitated with water, and assisting to suspend in it many insoluble substances. It consists of Oil (which contains much Elaine with a little Stearine) 28·75, Albumen 17·47, and water 53·8, with a little free Sulphur, and Phosphorus in combination.

Action. Uses.—The White of Egg is used chiefly for the clarification of watery liquids with the aid of heat, and of spirituous ones without heat. It may be used as an antidote in poisoning by Corrosive Sublimate and the salts of Copper. It is sometimes employed as an emollient application. Agitated with Alum, it forms an astringent poultice. The Yolk, besides being nutritive, is extremely useful in pharmacy in making Emulsions, and suspending Oils, Oleo-resins, and Resins.

Class Mammalia, *Linn.*

Order Cetacea, *Linn.*

Cetaceum, B. Physeter macrocephalus, *Linn.* Cetine, nearly pure (mixed with Oil), separated by filtration and pressure from the Oil contained in the head, and afterwards purified. Spermaceti of the Sperm Whale or White Cachalot.

Spermaceti is found in peculiar cells situated in the great head of the above Whale, which inhabits the Pacific Ocean and China Sea. It is here mixed with Oil. Some also is contained in other parts, as the blubber. It is itself of the nature of a concrete fat. An oily substance is disposed in numerous cells situated in a great cavity along the upper jaw of the animal, which is separated from its blubber by a ligamentous covering, and supported by ligamentous partitions projected across, as fully described by John Hunter. The liquid contents of the head being taken out and boiled, on cooling the Spermaceti concretes, while the valuable Oil swims, and is further separated by draining and pressure. Subsequent fusion and the action of a weak alkaline solution purifies the Spermaceti, which is then seen in beautiful white, pearly, crystalline masses, soft and slightly unctuous, with little odour or taste ; Sp. Gr. 0·94 ;

capable of being powdered with the addition of a little Spirit; melting at 112°; burning readily; insoluble in water, slightly soluble in Alcohol, more so in Ether, and readily in fixed and volatile oils. Spermaceti may be separated from any oil it contains by boiling Alcohol, which dissolves its pure principle.

The name *Cetin* has been applied to Spermaceti when pure and free from oil. It then melts at 120°. It resembles in its chemical nature the *Myricin* of Wax (q. v.) It is saponified with difficulty, when two substances are formed; one a neutral crystallisable fat, which can be sublimed, and has been called *Ethal;* and the other *Ethalic acid*, which approaches Margaric acid in nature. Ethal is also called *Cetylic Alcohol*, for it seems to be the hydrated oxide of a radical called *Cetyle* ($C_{32}H_{33}$). *Ethalic acid* is probably isomeric with Palmitic acid ($C_{32}H_{32}O_4$). It may be formed by the oxidation of the *Cetylic Alcohol.* (Brodie.)

Action. Uses.—Emollient; formerly much given internally with Mucilage or yolk of Egg; now chiefly used externally in cerates and ointments.

UNGUENTUM CETACEI, B. Spermaceti Ointment.

Prep.—B. With gentle heat melt together *Spermaceti*, ℥v.; *White Wax*, ℥ij.; and *Almond Oil*, Oj. Stir well till it cools. (The *Ceratum Cetacei* of the L. P. contained 4 times as much Wax.)

Action. Uses.—The Spermaceti Ointment and Cerate are both emollient dressings, the former of softer consistence than the latter.

Order RUMINANTIA, *Linn.*

OS USTUM, B. Bone Ash. Bones obtained from the Ox,—Bos Taurus, *Linn.*

The bones of Mammals consist of Gelatine, and of about 60 per cent. of earthy matter, the greater portion of which is Phosphate of Lime, with about 1-5th of Carbonate of Lime, and small portions of other salts. This is obtained by burning away the gelatinous part in an open fire, and then powdering the earthy remains. These are used for making the Phosphates of Lime and Soda.

If bones are burnt in close vessels, *Carbo animalis* (p. 57), or impure Animal Charcoal, is obtained, which consists of Charcoal and Phosphate of Lime. This is much used for purifying Sugar, the vegeto-alkalies, &c.

The Gelatine of Bones is not officinal, but it is often used dietetically in making nutritious soups. The earthy parts, being soluble in dilute Hydrochloric or Muriatic acid, are removed by digesting bones in such an acid solution, having first carefully cleaned them by boiling and scraping, and subsequently washing; the Gelatine is then boiled out, and flavoured, or with vegetable additions converted into Soup. The diet of man, to be properly nutritious, requires to be of a mixed nature, and Bone Gelatine is as well suited as anything else to be one of its constituents, though, like other proximate principles, it will not suffice by itself.

Pepsine is frequently prepared from the stomach of the calf (*see* p. 757).

FEL BOVINUM (PURIFICATUM), B. Ox Bile, purified. Inspissated Ox-gall. Bos Taurus, *Linn.*

Ox-gall was long ago much used in medicine, and its use has been lately revived. The bile, or secretion of the liver, possesses similar characters in all animals of the class Mammalia. It is a viscid, transparent fluid, greenish-yellow in colour, mixing freely with water, with an alkaline reaction, a nauseous and bitter taste. It may be purified by evaporating to dryness, and acting upon the residue with rectified Spirit. This dissolves all except the mucus of the gall-bladder. The remainder may be freed from colouring matter by animal charcoal, and from *Cholesterine* (a solid fat or wax), by shaking with Ether, from which the bile separates as a lower stratum. Evaporated again to dryness it forms a yellowish resin-looking mass. Bile contains 10–12 per cent. of earthy and alkaline salts, which are left as ash when it is burnt. The remainder, the true bile, has a complex composition, which has been cleared up by the researches of Strecker. It consists of the soda-salts or soaps of two fatty acids, *Cholic acid* and *Choleic acid* (also called *Glyco-cholalic* and *Tauro-cholalic*). Each of these acids is supposed to consist of a ternary or non-nitrogenous acid, combined with a nitrogenous body. In the first acid *Cholalic acid* is combined with *Glycocine*, in the second the same acid is united with *Taurine*, which contains Sulphur as well as Nitrogen.

Prep.—B. Take of *fresh Ox Bile* Oj., *Rectified Spirit* Oij. Mix the Bile and the Spirit by agitation in a bottle, and set aside for twelve hours until the sediment subsides. Decant the clear solution, and evaporate it in a porcelain dish by the heat of a water bath, until it acquires a suitable consistence for forming pills.

The Bile is freed from mucus as above described, but not separated from the cholesterine or colouring matter. It is described as follows: —"A yellowish-green substance having a taste partly sweet, and partly bitter, soluble in water and in spirit. A solution of one or two grains of it, in about a fluid drachm of water, when treated, first with a drop of freshly-made syrup consisting of one part of sugar and four of water, and then with Sulphuric acid cautiously added until the precipitate at first formed is redissolved, gradually acquires a cherry-red colour, which changes in succession to carmine, purple, and violet." This is Pettenkofer's test for bile. The reaction depends upon the presence of Cholalic acid. The watery solution of bile should give no precipitate (mucus) on the addition of rectified Spirit.

Action. Uses.—Its action is rather obscure. It is laxative, and esteemed by some as Tonic, Alterative, and useful in Dyspepsia.

Dose, in pills, gr. v.–gr. x.

[CORNU, L. Cervus Elaphus, *Linn.* Horn and Horn-shavings of the Stag. Cornu ustum, L. Burnt Horn; (impure Phosphate of Lime.)

The antlers of the Stag, or rather of the male called Hart, are known officinally as Hartshorn and Hartshorn-shavings. They are selected because they differ in chemical composition from common horn, as of oxen, sheep, &c., which is analogous to coagulated Albumen. The antlers of the Stag, which are shed annually in spring, have the composition of Bone, that is, Gelatine 27, and Phosphate of Lime 57·5, with one part of Carb. of Lime. The Gelatine, however, is more soluble in boiling water than the Gelatine of bones. Subjected to destructive distillation, an impure Carbonate of Ammonia is obtained. This is so well known by the name of Spirit of Hartshorn, that other perparations, not so obtained, are called by the same name. When burnt, Hartshorn yields ashes consisting almost entirely of Phosphate of Lime.

Action. Uses.—Hartshorn shavings, boiled in water, yield a nutritious and colourless jelly, which may be used for the same purposes as that obtained from Isinglass or other sources. They are employed in the preparation of Pulv. Antim: Comp., L.]

MOSCHUS, B. Moschus moschiferus, *Linn.* Inspissated secretion from the preputial follicles, dried. Musk. (Imported from China and India.)

The Musk animal differs from common Ruminants, in the absence of horns, and in having long canine teeth on each side of the upper jaw. It inhabits the mountainous regions of Central Asia, including Thibet, and extending from the Himalayas to the Altai Mountains, and from these to China. Hence, as in the case of Rhubarb from the same regions, we have Russian, China, and Indian Musk. It is singular that the common Hindoo name of the Musk, and in the Himalayas that of the Musk animal, is *kustooree*, a name similar to Castoreum, a substance which Musk so closely resembles in nature. The name *musk* is no doubt derived from the Arabic *mishk*, or *mooshk*, which is evidently the same word as the Sanscrit *mooshka.* This has been used as a perfume and as a medicine by the Hindoos from very early times. It seems to have been adopted from the Hindoos by Serapion, but it was previously mentioned by Ætius.

The animal bears a close resemblance to the Deer tribe in shape and size. It is usually less than three feet in length, with the haunches somewhat more elevated than the shoulders. The want of horns and the projecting canines have already been mentioned. There are altogether 32 teeth: namely, 8 incisors in the lower jaw, 2 canines in the upper, and 24 molars. The canines are not met with in the female. The ears are long and narrow, and the tail very short. The fleece, which consists of strong, elastic, undulated hairs, varies in colour with the season, the age of the animal, and perhaps the place which it inhabits. The general colour is a deep iron grey. The individual hairs are whitish near the root, and fawn-coloured or blackish towards the tip. The gestation of the female was quite unknown until Mr Hodgson in Nepal ascertained that it was about 170 days. They are extremely timid, mild, and gentle in their nature. Found on the tops of difficultly-accessible and generally open mountains, usually in the neighbourhood of the snow, but coming nearer to the plains according to the inclemency of the seasons, springing from rock to rock with great agility.

The Musk animal is particularly distinguished by the secretion in the males of the remarkably strong-smelling secretion called Musk, in a plano-convex, oval, hairy bag, of which the opening is situated just before the præputial orifice. The sac is flat, smooth, and naked, above, where it is applied against the abdomen,—convex below, and hairy,—composed of several coats. The Musk is secreted by small, gland-like bodies, situated in little pits on the most internal of these coats. The quantity in each sac varies from 1½ to 3 drachms. It is most abundant in the rutting season, and when fresh is soft, and of a reddish-brown colour. When dried, and contained in its native sacs, it forms the Musk of commerce. The kinds known are the Chinese and Siberian; the last is inferior in its fragrance to the other. The Chinese is probably from the same kind of cold and lofty region as the Himalayan. Some of this is imported into and apparently consumed in India. Much also is obtained in the mountain region on the borders of Thibet and North-west Hindostan. Col. Markham (*Travels in the Himalayas*) has given an interesting account of its collection. He states that it is often seriously sophisticated.

Musk is in grains or lumps, soft and unctuous to the touch, of a reddish-brown colour, with a powerful, penetrating, and diffusive smell. The taste is bitter, disagreeable, and somewhat acrid; it is readily inflammable. Rectified Spirits and Ether are the best solvents of Musk. Analysed by different chemists, it has been found to contain Stearine, Elaine, Cholesterine, free Ammonia, various salts and animal principles, as Albumen, with an odoriferous principle which seems particularly attached to the Ammonia. This principle is in great part destroyed by heat, and cannot be separated from *Musk* by distillation. But the quantity and proportion of the constituents vary considerably, perhaps from the difficulty of obtaining specimens which have not been subjected either to abstractions or to additions.

Artificial Musk, said to be composed partly of a mixture of dried blood and ammonia, and sewed up in a piece of the skin of the Musk Ox, is extensively manufactured by the Chinese merchants at Canton.

Action. Uses.—Stimulant, Antispasmodic, slightly Hypnotic. M. Trousseau considers it useful in some nervous affections, and states that it is Aphrodisiac. It may be given in 5-grain pills every three or four hours, increasing the dose to gr. xx.

SEVUM (PREPARATUM), B. Ovis Aries, *Linn.*, the Sheep. Internal fat of the abdomen, purified by melting and straining. Suet. Prepared Suet.

The Sheep, domesticated from the earliest times, is supposed to be derived from *Ovis Argali*. Its flesh, in the form of Mutton and

Lamb, is well known as a highly nutritious article of diet. The Suet or Fat, taken chiefly from within the abdomen, especially near the kidneys, is alone officinal. It may be prepared for use by melting and straining. (B.) Suet is white, firm in consistence, brittle, with little smell, and of a bland taste. According to Chevreul, it consists of Stearine and Oleine, with Hircine and a little Margarine. The two first are abundant also in Lard. Hircine is a liquid like Oleine, but differs in being much more soluble in Alcohol. Suet requires for its fusion a higher temperature (103°) than any other animal fat, owing to the large proportion of Stearine it contains. It is composed of Carbon, Hydrogen, and Oxygen.

Action. Uses.—Emollient. Useful in giving consistence to ointments and plasters.

LAC, B.—Milk is a peculiar liquid secreted by the mammæ of mammiferous animals for the support of their young. That of the Cow is most commonly used in this country, though that of Goats and Asses is also employed, and that of Buffaloes and Camels in Eastern countries. It is remarkable that the milk of Carnivora is of the same general nature as that of the vegetable-feeders. Cows' milk, however, being that usually made use of as a demulcent, or as an antidote in cases of poisoning, and officinal for making the *Mistura Scammonii*, it will be sufficient to notice its constituents.

Milk is white, and appears homogeneous, but is in reality an emulsion composed of a transparent serous fluid, with numerous globules of fatty matter floating in it. When allowed to rest, these separate in the form of *Cream*, which, by agitation, pressing out the whole of the liquid (*Butter-milk*), and washing with water, is converted into *Butter*, which still retains some of the serous fluid. It is sometimes further purified by melting it, as in the case of the *clarified Butter* or *ghee* of India. Butter contains Stearine and Oleine, the proportions of which vary at different times. In addition to these it contains an odoriferous fatty principle, *Butyrine*, which has not yet been isolated, but yields on saponification four volatile fatty acids,—*Butyric*, *Caproic*, *Capric*, and *Caprylic*. There is also a yellow colouring matter. Milk is said to be *skimmed* when the cream has been removed, and will of itself become acid, when the clots termed *curds* separate from it. But if an acid or rennet be added, an albuminous substance separates, which is the basis of Cheese, and is called *Caseine*. This differs from the Albumen of Egg (p. 748) in not coagulating with heat. The residual serous fluid, or *Whey*, will, on evaporation, yield *Sugar of Milk*, *Lactic acid*, and other substances. The composition of Milk, according to M. Haidlen, is water 873, solid residue 127, Butter 30, Caseine and insoluble salts 51, Sugar and soluble salts 46. The salts are combinations of Phosphoric with Lime, Magnesia, and Peroxide of Iron, Chloride of Sodium and Potassium,—and Soda in combination with Caseine. The Sp. Gr. of Milk varies from 1·030 to 1·035. When fresh, it has always an alkaline reaction, but soon becomes acid from the speedy conversion of its Sugar into Lactic acid. (*See* Simon, *Animal Chemistry*, ii. p. 62.)

Action. Uses.—Milk is nutritious as an article of diet, and useful as a Demulcent, as also in cases of acrid poisoning, as by Corrosive Sublimate, Sulphate of Copper, or Nitrate of Silver.

SACCHARUM LACTIS, B. A Crystallised Sugar, obtained from the whey of Cow's Milk by evaporation. Sugar of Milk. Lactine.

Sugar of Milk, formerly officinal only in the D. P., finds a place in the British Pharmacopœia. Its composition is $(C_{24}\,H_{24}\,O_{24})$. It thus differs from Cane Sugar, as well as from the sugar of fruits. It resembles Gum in producing Mucic acid, when acted on by Nitric acid and other oxidising agents. It is thus regarded as a sort of connecting link between Sugar and Gum. It is not easily fermentable, like the other sugars. But Hess has shown that it may be fermented under certain conditions, and it has long been known that the Tartars prepare an intoxicating drink from Mare's Milk, and the Arabs from that of Camels.

Lactine is a constituent of the milk of all mammalian animals. The Whey, which remains after the separation of the fatty matter and Caseine, holds in solution the Salts and Sugar of Milk, with some nitrogenous matters. These last decompose the Lactine if the Whey is kept long, forming *Lactic acid* $(C_6\,H_5\,O_5)$, and turning the whey sour. Sugar of Milk is prepared largely in Switzerland, from the whey of cow's milk, left after the manufacture of cheese. The whey is evaporated to a syrup, decolorised by animal charcoal, and the sugar crystallised on pieces of stick or string stretched across the vessels. It is thus "usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes; greyish-white, crystalline on the surface and in its texture, translucent, hard, scentless, faintly sweet, gritty when chewed." (B.)

Sugar of Milk requires 5 parts of cold, 3 parts of boiling water, for solution. It is slightly soluble in Rectified Spirit. It crystallises n 4-sided prisms, of great hardness.

Action. Uses.—It possesses no activity as a medicine, but is chiefly employed in powders, being used to dilute more active drugs. A olution mixed with cow's milk has been recommended for infants as substitute for the milk of the mother.

LACTIC ACID may be obtained from sour milk by neutralising it with chalk, purifying the Lactate of Lime by solution and crystallisa- ion, and decomposing it with Oxalic acid, &c. Or Carbonate of inc may be used instead of chalk, and the Lactate decomposed by current of H. S. The filtered fluid contains the Lactic acid; it may be reduced by evaporation to an intensely sour syrup of Sp. r. 1·215. The acid does not crystallise, but forms soluble crystal- ne salts with alkaline and metallic bases. The *Lactate of Iron* orms a valuable remedial agent (*see* p. 174). As Lactic acid is an gredient of the gastric juice, and an important agent in digestion, it is of considerable use in various forms of dyspepsia, being a more reliable agent than *Pepsine* (p. 757).

Dose.—ʒß–ʒj., with syrup, before meals.

Order PACHYDERMATA.

ADEPS (PRÆPARATUS), B. Purified Fat of Sus Scrofa, *Linn.* The Hog. Hogs' Fat. Lard. Prepared Lard. *Axungia.*

The Hog is well known both in its wild and domesticated state. Its flesh was prohibited as an article of diet both to the Jews and Mohammedans. The fat about the loins, having greater consistence than that of other parts, is preferred for medical use ; but that of the omentum and mesentery is also employed, as well as the subcutaneous fat. It is prepared much in the same way as Suet, but it should be kept stirred to prevent the separation of its constituents. That commonly sold contains salt, which renders it unfit for medical use, until it has been melted in boiling water to remove the salt. *Adeps præparatus,* of the B. P., is the internal fat of the abdomen, deprived of its membranes, and purified by straining, and keeping it for some time at a heat of 212°, constantly stirring.

Lard is white, with little odour and taste, of a soft consistence, though granular in appearance ; fusible at a temperature of from 80° to 90° ; partially soluble in Alcohol, readily so in Ether and the volatile oils ; when fused, it assists the melting of Wax and Resins ; it is converted into Soap by union with the alkalies. Exposed to the air it becomes rancid, that is, acrid in taste and disagreeable in odour. It is composed of Carbon 79, Hydrogen 11, and Oxygen 9 parts in the hundred, and of three proximate principles, Stearine and Margarine, amounting to 38, and Oleine, 62 per cent. These may be separated by the action of Alcohol, which deposits Stearine upon cooling as a white, concrete, and crystalline body, and yields the Oleine when evaporated. The Margarine may be separated from Stearine by being more soluble in cold Ether. Both also may be separated from Oleine by pressure or congelation.

Lard has lately been very extensively adulterated. Mr Whipple has found more than 20 per cent. of farinaceous matter in some specimens. In *American Lard* (prepared in England) Mr Crace Calvert has found, in addition to this starch, about 10 per cent. of water, 2·3 of Alum, and 1 of Lime. These materials are purposely mixed in by machinery, that by their opacity and by causing division of the fatty particles, they may render the lard whiter. These impurities should be tested for, before the lard is used for medicinal purposes. It should be free from salt. " It has no rancid odour, dissolves entirely in Ether. Distilled Water, in which it has been boiled, when cooled and filtered, gives no precipitate with Nitrate of Silver, and is not rendered blue by the addition of solution of Iodine." (B.)

Action. Uses.—Lard, like other fats, is Emollient, and used as a basis for various Cerates and Ointments. It is occasionally employed as an ingredient in laxative Enemata.

Pharm. Prep.—Unguentum Simplex. (*See* CERA.)

ADEPS BENZOATUS, B. Benzoated Lard.

Prep.—Take of *Prepared Lard*, ℔j.; *Benzoin*, reduced to coarse powder, gr. clx. Melt the Lard by the heat of a water-bath, add the Benzoin, and, frequently stirring them together, continue the application of heat for two hours; finally remove residual Benzoin by straining.

(Introduced in 1867. Benzoated Lard has been long recommended by pharmaceutists. It is less liable to become rancid than ordinary Lard, and the preparations made with it may be kept for a long time unchanged. It is used now in making the Ointments of Galls, Acetate Lead, Sulphur, and Zinc, and the Suppositories of Tannic acid, Mercury, Lead, and Morphia.)

PEPSINA. Pepsine. The Albuminous digestive principle of the stomach of Mammalia.

This ingredient of the gastric juice was first isolated by Schwann, and has since been investigated by other chemists in Germany, France, and England. It appears to be a peculiar modification of Albumen, a proteine body possessing catalytic properties. In conjunction with one or more acids, and water, it forms the gastric juice which is secreted by the stomach of animals for the purpose of digestion. In many instances of dyspepsia, which appear to depend on a deficiency of this natural secretion, it has been thought desirable to supplement it by remedial means. Accordingly, Pepsine has been rather extensively used in medical practice during the last few years. Its excessive proneness to decomposition, and the fact that a heat above 120° destroys its activity, make it exceedingly difficult to obtain it in an available form, and are likely to prove fatal to its reputation as a medicine.

Prep.—There are many ways in which Pepsine may be prepared, few in which it can be preserved.

M. Boudault prepares it from the stomach of the calf, and mixes the Pepsine with Lactic acid and Starch. The animal is to be killed fasting. The stomachs (rennet-bags) are then well washed in water. The mucous surface is scraped off, reduced to a pulp, and digested for twelve hours in water. The liquid is filtered, and the Pepsine precipitated by a solution of Acetate of Lead. It is then suspended in water, and freed from Oxide of Lead by a current of H. S. The filtered liquid holds the Pepsine in solution, and must be cautiously evaporated at a heat not exceeding 100°. A substance resembling dried mucus is obtained. M. Boudault adds to it a small quantity of Lactic acid, and then a large quantity of Starch. The product is sold as "medicinal pepsine," of which one part, it is said, will dissolve 4 parts of fibrine at a temperature of 98°. Sometimes it possesses little or no activity, and what it has may be partly ascribed to the Lactic acid which it undoubtedly contains.

The Pepsine obtained from the stomach of pigs appears to be more effective as a medicine. There is also reason to believe that the digestive virtues of the Pepsine are impaired by the use of lead in the process of preparation. M. Brucke has given the following directions for the preparation of *Pepsina porci*. Digest the mucous membrane of the stomach of pigs (recently killed) in dilute Phosphoric acid at a temperature of 100°. When portions appear to be detached, filter off the liquid, and macerate the residue in the same way till completely disintegrated. The liquids are now neutralised with lime water. The Phosphate of Lime precipitated contains the Pepsine. It is dissolved in very dilute H Cl, again precipitated with lime, again dissolved and filtered. A solution of *Cholesterine* in 4 parts of rect. Spirit and 1 of Ether is now shaken up with the acid fluid. The Cholesterine separates in fine particles, and carries the Pepsine with it. It is washed to free it from H Cl, and the Cholesterine separated by Ether. The Pepsine thus prepared is said to possess energetic digestive properties. It is strange, however, that M. Brucke finds that his Pepsine is neither precipitated by Tannin nor by Chloride of Mercury. Precipitates with these reagents, according to him, denote the presence of albumen.

Pepsine may also be obtained from the pig's stomach by the lead process, or Alcohol or Tannin (?) may be used as a precipitant.

Pepsine is a light, amorphous, nitrogenised principle, appearing to belong to the Albumen series, but of doubtful composition, as it has not been obtained quite pure. It is soluble in water, but decomposed by a heat above 120°. The solution digests and dissolves fibrine and coagulated albumen. The process is assisted by heat up to 100°, also by Hydrochloric, Phosphoric, and Lactic acids. Pepsine is tasteless and inodorous when pure. It is precipitated from its aqueous solution by Salts of Lead, Mercury, and Platinum, also by Alcohol and by Tannic acid. Its solution quickly decomposes at ordinary temperatures. A good test for Pepsine is, that when added to milk, it will first coagulate it, and then dissolve the coagulum. Dr Pavy has examined many samples of Pepsine prepared in London, and has found the great majority to be quite inert.

Action. Uses.—Given in dyspepsia occurring in asthenic patients, accompanied with distaste for food, pain, and nausea, and supposed to depend on an insufficient or improper secretion of gastric juice.

Dose.—Of pure Pepsine, gr. v.–gr. x., of Boudault's Pepsine, gr. xv.–gr. lx. The latter, even when at the best, will only dissolve four times its weight of the food taken afterwards. *Pepsine Wine* has been recommended, but as Alcohol precipitates Pepsine, its virtues seem doubtful. Mr Morson prepares a solution with Chloride of Sodium, under the name of *Liquor Pepticus.*

Pancreatine, the principle of the secretion which digests fats, prepared from the Pancreatic juice of the Pig, has been lately introduced into practice in this country. In cases where the patient digests fats with difficulty, 10 gr. of the Pancreatine of Messrs Savory and Moore may be taken in a glass of wine or water after a meal. A "Pancreatic Emulsion," made with lard, is recommended by Dr Dobell as preferable in many respects to Cod-liver Oil as a cure of Marasmus.

Order RODENTIA.

CASTOREUM, B. Castor Fiber, *Linn.* The preputial follicles and their secretion, dried. (From the Hudson's Bay Territory.) Castor, from the Beaver.

Castor, a substance analogous in nature to Musk, has been employed in medicine from the time of Hippocrates. It is described by the Arabs under the head of *joond bedustur.* The description by Dioscorides leaves no doubt about the animal, which is so interesting and remarkable for its *building* habits in North America, though those of Northern Europe, from *burrowing*, are supposed to constitute distinct species; but Cuvier states, that after the most scrupulous comparison of the Beavers which burrow along the

Rhone, the Danube, and the Weser, he has been unable to find any characters to distinguish them from those of North America. The Beaver is particularly distinguished from other Rodentia by its nearly oval tail (*a*), which is flattened horizontally, and covered with scales. It is peculiar also in the Castor-sacs, which are found both in the male and female, and of which a detailed account is given by Brandt and Ratzeburg. From them the accompanying illustration has been copied, as the Castor-sacs (*h h*) are often confounded with the testicles (*w w*), and their position is difficult to understand. They can be distinctly seen only on the removal of the skin of the abdomen. Besides these there are two others (*e e*), which are Oil-sacs. All are situated between the pubic arch and the cloaca, a common hollow which is covered by a wrinkled hairy protuberance, into which open the Oil and Castor-sacs, and the rectum (*b*), and prepuce (*i*.) The Castor-sacs are somewhat pear-shaped and compressed: they communicate by the same opening at their narrow extremities, but their fundi diverge. Like the musk-bags, these sacs have several coats; within all there is a convoluted mucous membrane, covered with scales, and a small brownish body, supposed to be a gland. The secreted matter, or Castor, in these sacs, is at first of a yellow-orange colour, but changes to a brownish colour as it becomes exposed to the air.

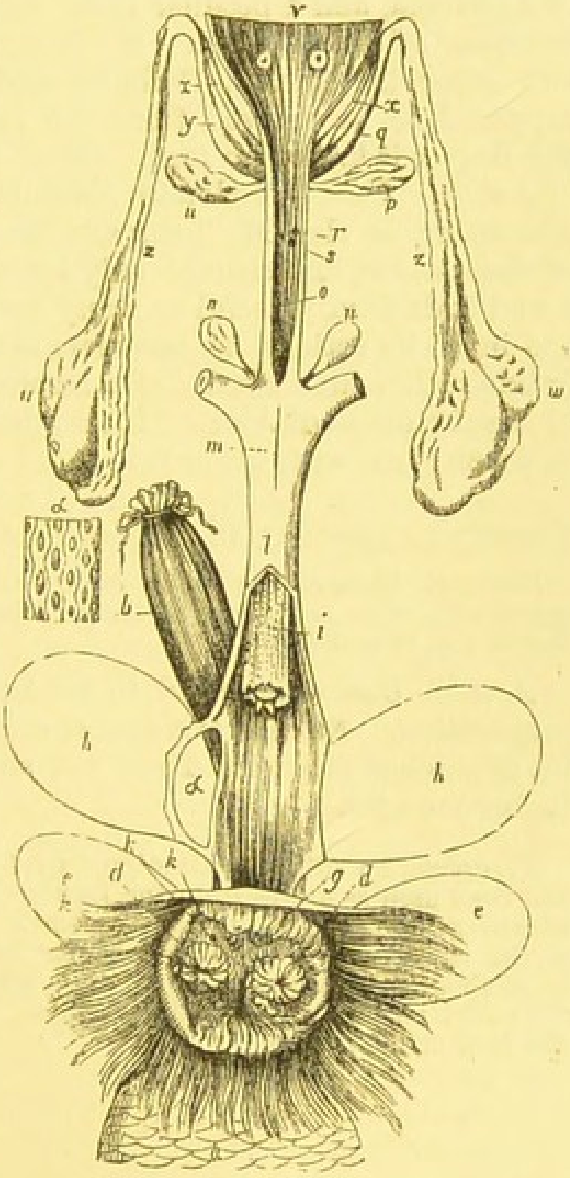

Fig. 113.

The Castor-sacs should be separated from the Oil-sacs, which are frequently attached to them. The latter are somewhat shorter and smaller, (B.)

Two kinds of Castor are known in commerce: one American, imported by the Hudson's Bay Company, and the other Russian, which is very rare. This may be distinguished by a Tincture of 1-16th part in Alcohol being of the colour of deep Sherry; while that with the American Castor is of the colour of

London Porter. The American, moreover, effervesces when dropped into an acid, which the Russian does not. (*Per.*) The sacs are usually united together by a part of the above excretory duct, and sometimes the oil-sacs may be seen with them. Internally they are divided into numerous cells, of which the membranes may be seen when the Castor is dissolved out; or when torn they may be seen intermixed with the Castor, which often breaks with a resinous fracture, and is of a reddish-brown colour. Its odour is strong, fœtid, heavy, its taste bitter and rather disagreeable. The chemical constituents, according to Brandes, are a volatile Oil, Resin, Ozmazome, Albumen, Mucus, Urate, Carbonate, Benzoate, Phosphate, and Sulphate of Lime, with Salts of Soda and Potash, some Carbonate of Ammonia, and a peculiar fatty substance, which crystallises, and has been called Castorin. M. Wöhler has lately found in Castor two other ingredients, Carbolic acid and Salicine. This last is supposed to be derived from the bark of the Willow, upon which the Beaver is known to feed. (P. J. xi. 200.)

Action. Uses.—Moderate Stimulant and Antispasmodic. Mr Alexander, as also M. Joerg and his pupils, having taken full doses of the Castor, experienced only eructations; but M. Trousseau has found it decidedly useful in many nervous and spasmodic affections, and in all its actions he considers it to resemble Valerian and Assafœtida rather than Musk. He recommends its union with Tincture of Assafœtida or of Aloes. It may be exhibited in powder or in pills in doses of gr. xxx.-gr. cxx.

TINCTURA CASTOREI, B. Tincture of Castor.

Prep.—B. Macerate for seven days *Castor*, in coarse powder, ℥j. in *Rect. Spirit* Oj., with occasional agitation. Strain, express, filter, and add *Rect. Spirit*, q. s. to make Oj.

Action. Uses.—Intended to be Antispasmodic, but is too weak a preparation. Animal excretions, employed in medicine, act chiefly by producing disgust. Their use should be exploded, as a relic of barbarous ages.

Hyraceum, an animal product imported from the Cape of Good Hope in 1850, has been used as a substitute for Castoreum, over which it has the doubtful advantage of being still more loathsome. According to Dr Pappe, it consists of the inspissated urine of the *Hyrax Capensis*. It is found in crevices and holes about the mountains where these animals resort, and is much valued by the native farmers as an antispasmodic. The *Hyrax* has no peculiar gland, like that of the Beaver.

PHYSIOLOGICAL AND THERAPEUTICAL ARRANGEMENT OF THE MATERIA MEDICA.

Dr Royle, in the Preface to the first edition of this work, observed, that the ultimate object of the accurate study of the articles of the Materia Medica was, " the acquirement of a knowledge of the modes of Action and Uses of these several Drugs as Medicines, which was necessarily the most important part of the whole study. When students attended the course of Materia Medica and Therapeutics in their first winter session, he found it most convenient to treat the former according to systems of Natural History; and then, towards the end of the course, grouped together all those Remedies which may be used for the same Therapeutical purposes." This it has been thought desirable to do, as a conclusion to the present work—with a few general observations appended to each group. From these, the student will be the more easily able to recall to his memory the fact of so many of the remedies being relative agents, having their tendencies and effects controlled by external influences, or the varying states of the constitution.

Classifications of Materia Medica are nearly as numerous as the authors who have written on it, and to all some objections may be made, from the very nature of the subject, in consequence of several remedies producing very different effects, and many diseases being curable by different methods of treatment. Many of the classifications have originated in the prevailing theories of disease; others depend upon the obvious effects which medicines produce; while some have proceeded from inquiries respecting their mode of action in, or their tendency to particular organs or parts of the body. These inquiries resolve themselves into the two heads—1. An examination of the medicines which are capable of producing changes; and, 2. Of the nature and properties of the being in which these changes are effected. The latter is the province of Physiology, a science which is so successfully prosecuted in the present day. This, and the improved knowledge of Animal Chemistry, have given a great value to the investigations of several modern observers. Some of the effects produced by the exhibition of medicines are of a temporary nature; such, for instance, as depend upon the cold or hot state in which they may be exhibited. These, however, soon give place to the phenomena which are due to the peculiar action of the medicine, and which may be of a *local* or of a *general* nature. Allowing this, discussions have occurred respecting the mode in which the effects of medicine are produced, whether by their acting only on the part to which they are applied, or by their absorption and circulation with the blood, and thus being carried to the part susceptible to their influence. Some have conceived that the effects of medicines are due to their acting upon the nerves of the part to which they are applied, whence their action is propagated to remote parts by sympathy. But modern experimentalists have proved that most remedies are absorbed, and can be detected in the secretions—though some of the effects, perhaps all the effects of some medicines, may be due to nervous agency. Dr Blake has shown that the rapidity of absorption and of the circulation are sufficiently great to account for the effects of the most rapidly acting medicines or poisons. M. Mialhe affirms—

"1. That a remedy must be absorbed before it can exert any remote action on the animal economy.

"2. That the remedy must be soluble, or susceptible of becoming so, in the fluids of the living body, before it can be absorbed.

"3. That most remedies are subject to chemical changes during their passage through the animal system.

"4. That these changes are regulated by ordinary chemical laws, and that they may therefore be foretold, and even made available in the cure of disease."

If a medicine is soluble, and is not decomposed by the fluids of the alimentary canal, it is absorbed at once; but if it is insoluble, then it requires the intervention of the acids, alkalies, or saline compounds contained in the digestive fluids, in order to obtain an entrance into the circulation.

In this the Metals, the greater number of the metallic oxides, and certain salts, are dissolved by the acids of the gastric juice.

The Metalloids, such as Sulphur and Phosphorus, the insoluble acids, certain insoluble salts, oils, resins, balsams, &c., are rendered soluble by the alkaline matters contained in the intestinal fluids.

Other insoluble salts, such as calomel, sulphate of lead, chloride of silver, &c., are acted on and dissolved by the alkaline chlorides, which are present throughout the whole course of the alimentary canal.

Much has been done by Wöhler and others on the Continent, and by Drs Golding Bird and Bence Jones in this country. The question of the action of medicines is treated at length by Dr Headland, in his Essay on the Action of Medicines.

Applied to the surface, conveyed into the interior, or absorbed into the circulation, medicines may produce their effects, either by their general *physical*, by their *chemical*, or by what have been called their *dynamical* properties, which probably means that they take place in the living body, and are exerted by the *Vital Agents* of other authors.

Of these Vital Agents, some *Stimulate* or *Excite*, others *Depress*, and are called *Sedatives* or *Contra-Stimulants*. A third set produce some change in the solids or fluids of the body, and are named *Alterants* or *Alteratives*. The alterations which medicines produce in the structure or functions of organs are called their effects. Of these some are immediate, precede absorption, and being also capable of production in healthy individuals, are called *Physiological*, while those which they produce in curing diseases are called their *Therapeutical* effects. The primary action of Medicines may, according to Barbier, be explained—1. By direct action on the organs which receive them. 2. By the medicinal particles being absorbed into the blood. 3. By sympathetic action. 4. By contiguity of organs; and 5, By revulsion.

The mode in which these effects are produced has been differently explained by different theorists. One of the oldest of these theories is what has been called the Humoral pathology, in which diseases are supposed to be cured by the system getting rid of some peccant humour. The Hippocratic maxim is, that contraries are to be cured by contraries; but the fanciful idea of a modern theorist is, that cures are to be made by medicines which can produce effects similar to the symptoms of the disease. According to the Brunonian theory, all medicines are stimulant, and differ from each other only in degree. They are supposed "to cause exhaustion, by producing previous over-excitement." The modern Italian doctrine, or that of contra-stimulus, admits two classes of medicines, that of Stimulants, and of Contra-Stimulants, or Sedatives, to be employed respectively against asthenic and sthenic disorders. Broussais admitted Stimulants and Debilitants, but particularly called attention to the Revulsive action of medicines, by which determination was induced from the seat of disease to the part affected by the medicinal action. Dr Headland has observed that "none of these ideas being by itself perfect, the sounder reasoners of the present day are driven to suppose that there are various different ways in which medicines may *counteract*, and thus cure different diseases. This *counter*-action is different from contrary action; it may be direct or indirect; and it allows of any action in a medicine, tending to restore health, except an effect similar to the disease."

Classifications of Materia Medica have been made according to their Physiological action, and a few according to their Therapeutical effects. But most authors have preferred—probably as best suited to the state of knowledge, and, upon the whole, as most useful—classifications founded upon the obvious general results, or ultimate effects of medicines. Dr Cullen made a distinction of medicines as acting upon the Solids, or upon the Fluids of the body. Dr Young introduced Chemical agents, but arranged the greater number of remedies under the head of Vital Agents, and ranked Specifics as Insensible Agents. Dr Murray divided the several groups of medicines into the four heads of General Stimulants, Local Stimulants (that is, Evacuants), Chemical Agents, and Mechanical Agents. Dr M. makes the mistake of including Sedatives with Narcotics, under one head with Stimulants. He was followed by Dr Duncan, who makes five great divisions. Aliments used as Medicines, Evacuants, Stimulants, Depressants, and Chemical Agents. Dr A. T. Thomson and Dr Paris have adopted Dr Murray's Mechanical and Chemical Agents, along with Dr Young's Vital Agents. The additions which have been made have contributed to make these arrangements clear and sufficiently comprehensive: Dr Royle has adopted them as being useful for practical purposes. In these improved arrangements, we find that reference is made to the local tendencies of medicines. For instance, Evacuants have been mentioned by Dr Murray as Local Stimulants, or those which act locally on glands. Dr Thomson has divided his Vital Remedies into those which act on the nervous system, on the secerning system, and into those which act on the muscular and sanguiferous systems. Some classifications have been formed from these local tendencies of medicines—as, for instance, that of Dr Pereira, who after three classes of external agents, names his fourth class Hæmatica, or blood-medicines, among which he places Acids, Alkalies, and Alteratives. Then follow Class v., Pneumatica; Cl. vi., Neurotica; Cl. vii., Cœliaca; Cl. viii., Eccritica; Cl. ix., Genetica. Dr Headland's classification is based on the same general principle of the tendencies of medicines, and consists of the following classes and divisions:—Class i., Hæmatics. Div. 1. Restoratives; 2. Catalytics. Cl. ii., Neurotics. Div. 1. Stimulants; 2. Narcotics; 3. Sedatives. Cl. iii., Astringents. Class iv. Eliminatives. (Essay on the Action of Medicines in the System.)

The investigations of the present day into the true action of medicines will, no doubt, greatly improve our physiological knowledge, and, consequently, all such classifications. But, in the meantime, we continue to make use of the arrangements founded on the general nature of the effects of medicines; and though we have made use also of the principal divisions under which the groups are arranged, it is evident that some of these indicate but indifferently the whole of the effects produced by the medicines arranged under them. Thus, the groups of Remedies arranged under the head of Mechanical, are chiefly articles of diet used medicinally, and, though a portion of their effects may be due to their physical properties, others must depend upon their being digested and absorbed into the system. So of the Chemical Remedies, a portion of their effects is no doubt due to their agency as such, even after they have been absorbed into the blood or carried into the secretions, but a great part also to their acting on the fluids and solids of a living body. This primary chemical action is, however, not confined to the groups arranged under that division, but participated in by those called, more especially, Vital Agents—for some of the effects of the Alteratives, as well as of some of the Tonics, are probably of a chemical nature, after their absorption into the blood. Hence they form the Hæmatics of some of the above classifications. A part, also, of the effects produced by some of the Evacuants is due to chemical action, but it is, for many reasons, convenient to keep them all together. The chief effect of Tonics, as well as of Stimulants, is generally considered to depend upon their action on the nervous system; but by some they are considered to act upon the muscular and sanguineous systems, though no doubt ferruginous preparations also act chemically. The true Stimulants, however, as well as the Narcotics and Sedatives, act chiefly upon the nervous system, but this does not exclude their also acting on the muscular and vascular systems.

A. MECHANICAL REMEDIES.*

Diluents. Demulcents. Emollients.

B. CHEMICAL REMEDIES.

Escharotics. Acids. Alkalies. Antilithics.
Disinfectants. Astringents. Antidotes.

C. VITAL AGENTS.

1. *Evacuants or Local Stimulants.*

Alteratives. Errhines. Sialogogues. Emetics. Expectorants.
Diaphoretics. Diuretics. Cathartics. Anthelmintics.
Emmenagogues. Rubefacients. *Counter-Irritants.* *Vesicants.*

2. *General Stimulants.*

Tonics. Stimulants and Aromatics. Diffusible and Special Stimulants.

3. *Depressants or Contra-Stimulants.*

Narcotics. Antispasmodics. Refrigerants. Sedatives.

A. MECHANICAL REMEDIES.

The groups of medicinal agents ranged under this head are supposed to act only as ordinary physical agents, or by their simple mechanical properties, and are therefore considered in general to be of little importance. But as numerous cases occur in which we require by dilution to diminish the acridity of a secretion or to increase the solvent powers of an excretion, to sheathe an irritated canal, or to protect an abraded surface, so we must have recourse to the milder class of remedies, which are as well suited for such purposes as the more powerful are for the graver states of disease.

DILUENTS.

The term Diluents is applied to such remedies as are supposed to increase the fluidity of the blood ; but as most of these are Demulcents, dissolved in large quantities of water, it is to this fluid that they owe any efficacy which they possess. Dr Cullen applied the term of Attenuants to such remedies as had the power of diminishing the cohesion of parts. The general effect of Diluents is to allay thirst and to diminish heat of skin, to promote transpiration from the skin, as well as increase the flow of urine. The greater or less dilution will influence, moreover, the action of other remedies. The

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* Dr Royle's classification, which is convenient for practical purposes, is adhered to in this work —F. W. H.

small quantity of nutritious matter will be easily digested and the water quickly excreted. This, if pure, cannot fail to be useful as a solvent, and aid in the elimination of effete matters. To such action must be ascribed much of the beneficial effects produced on patients who resort to "watering-places," and who drink large quantities of water, taking, at the same time, much exercise in the open air.

If the imbibition of water have the effect of increasing the fluidity of the blood, abstinence from this fluid ought to have the effect of rendering it more dense. This forms what is called dry diet, or *dry treatment*, as recommended by Dr Williams for the cure of coryza, &c.

Aqua. Distilled Water.
Rain or pure Spring Water.
Toast and Water.
Barley Water.
Rice Water.
Thin Gruel.
Whey, as in the "Whey cure."
Much diluted Demulcents, &c.

DEMULCENTS.

Demulcents, as their name indicates, include such substances as are calculated to soften and lubricate the parts to which they are applied. Though having the same signification as the word Emollients, it seems desirable to restrict the latter term to such as are intended for external application, and to apply the name of Demulcents to such as are intended for internal exhibition. We therefore retain in a separate group the mucilaginous, starchy, saccharine, oily, and gelatinous substances which are devoid of odour, mostly have little taste, and when dissolved or suspended in water, form a viscid solution or mixture. These are found useful in softening any preternaturally hard or dry part, in sheathing any abraded, and in allaying the irritation of any inflamed part. This they effect by rendering parts less sensible to the influence of even ordinary secretions, or by involving acrid matters in a viscid medium. They may even allay pain, when this depends on the tension and irritation of solid parts. Though the primary action is of a mechanical nature, the subsequent effects are due to vital agency. Like Diluents, they will diminish thirst, internal heat or irritation, and thus be useful in cough and other pulmonary affections, in irritation or inflammation of the fauces, gastro-intestinal membrane or urinary organs; and the more such organs are irritated, the greater often is the soothing influence which is experienced.

If long continued, they may prove too relaxing, and consequently debilitating, but being more or less nutritive, and most of them readily digested as well as unirritating, they are frequently employed as articles of diet for the sick and convalescent. They may therefore be arranged according to the nature of their proximate principles, as this will serve at the same time to give a general idea of the articles of diet, of most of which water (*see* Diluents) forms a large proportion. A few saline substances also form constituents of most articles of diet.

The first group of these Demulcents, many of which are also

Articles of Diet, includes the vegetable proximate principles enumerated at p. 264, which, with Carbon, contain Oxygen and Hydrogen in the same proportions as Water, and are sometimes called Hydrates of Carbon.

Mucilaginous.—This includes plants containing mucilage and the different kinds of gum, which when infused in water form mucilaginous solutions; as

Malva.
Althæa.
Inf. Lini.
Cydonia.

Pate de Guimauve.
Acaciæ Gummi. Mucilago.
Tragacantha. Mucilago, et Pulv. comp. with Starch and Sugar.

Amylaceous.—These consist of the different kinds of Fecula or Starch, which require to be acted on by boiling water, when the external lamina is burst, and the enclosed amidine becomes dissolved and forms a bland unirritating solution. Chemical Physiologists infer that it is rendered soluble by the Pepsine of the Gastric juice; when being converted first into Dextrine, then into Glucose or Grape sugar, it is absorbed by the capillaries of the veins.

Amylum.
Arrowroot.
Tous les Mois.
Sago.

Tapioca.
Rice Starch.
Potato Starch, &c.

The Cereals also contain Starch, but mixed with other principles, as in Tritici Farina, Avena, Hordeum, Rice and Maize.

Saccharine.—This term, especially applicable to sugar and other sweet-tasted substances, is sometimes made to embrace also the two preceding groups, as being nearly identical in chemical composition, and similar in physiological action.

Saccharum. Saccharum Lactis.
Syrupus. Theriaca.
Mel.

Glycyrrhiza, Extractum.
Uvæ passæ.
Fici.

The Mucilaginous, Amylaceous, and Saccharine groups are supposed to be useful, as articles of diet, in promoting the formation of adipose tissue, but chiefly in being converted into Glucose, then into Lactic′, finally into Carbonic acid, and thus, with the oleaginous substances, forming, according to Liebig, the elements of respiration.

Oleaginous.—These are also ternary compounds of Oxygen, Hydrogen, and Carbon, but the Hydrogen here is greatly in excess. Most have a great affinity for Oxygen. They contain two or three different principles, as *oleine* or *elaine*, which is fluid, with margarine and stearine, which are solid. As medicines they are usually made into emulsions with Gum Arabic, Tragacanth, or Yolk of Egg. As articles of diet they are absorbed by the lacteals, and besides promoting the formation of adipose tissues, are considered also to become oxidised in the system, and thus, like the preceding carbonaceous groups, to support animal heat. They are hence called calorifacients.

Vegetable Oils.
Ol Olivæ.
Ol. Papaveris.
Ol. Amygdalæ.

Animal Fats.
Adeps.
Cetaceum.
Cera.

Gelatinous and Albuminous.—This includes all the substances which are also called nitrogenous, from having Nitrogen as a constituent, as well as Oxygen, Hydrogen, and Carbon. Some of these, though in small quantities, are also contained in vegetables, as in the gluten of wheat, in almonds, pulses, &c.; in fact, vegetable albumen is very similar in composition to fibrine. Liebig has ingeniously distinguished these as the plastic elements of nutrition, that is, vegetable albumen, fibrine and caseine, as well as animal flesh and blood, all which are rendered soluble by the action of the acid of the gastric juice and pepsine.

Gelatinous—Formed of Gelatine or Jelly dissolved in water:—
Isinglass.
Hartshorn Shavings.
Calves' Feet, &c.

Albuminous—Coagulated by acids and the action of boiling water:—
White and Yolk of Egg.
Milk.

EMOLLIENTS.

Emollients, as their name indicates, from "emollire," to soften, are medicines calculated to soften the tissues with which they are brought into contact. As it seems convenient to retain the term for such as are intended for external application, and that of Demulcents for internal remedies, so Emollients may include the Expressed Oils, Liniments, and Embrocations, with many Cerates and Ointments, as well as the majority of Cataplasms and Fomentations. The effects of these, as well as of the other Emollients, is to soften and to diminish the tone of parts to which they are applied. Some, it is supposed, by insinuating their particles into the substance or tissue of the part or organ, serve to relax and to render these more supple. Though a portion, therefore, of the effects may be due to this permeation, it has also been inferred, from the rapidity of the relief which is sometimes experienced, and more or less deeply, from warm and moist applications, that something may be due to contiguous sympathy.

Moist Heat, as from the use of warm Water or Fomentations.
Papaveris Dec.
Anthemidis Inf. and Dec.
Cataplasms with Althæa, Mallow, or Verbascum.
Bread and Milk poultice.
Dauci Radix.
Cataplasma Lini.
Cataplasma simplex, with Figs.
Papaveris Oleum.
Lini Oleum.
Amygdalæ Oleum.
Olivæ Oleum.
Cacao Butyrum.
Myristicæ Oleum expressum.
Palm Oil.
Sevum vel Adeps ovillus.
Adeps suillus.
Cataceum et Ung.
Cera alba et flava. Ceratum. Unguentum simplex.
Sapo. Linim. Saponis, with Camph. and Oil of Rosemary.
Lin. Saponis c. Opio.
Emp. Saponis.

Applications to Burns:—
Cotton.
Linim Calcis.

ANTHELMINTICS, mechanical, *see* p. 788.

B. Chemical Remedies.

This division holds a place in the arrangements of Murray, Duncan, and Thomson, and includes those remedies which seem to act chiefly by producing chemical changes in the solids or fluids of the body. By the last-named author, they are divided into those which act on the surface or on the contents of cavities, or change the state of the air. But though many chemical affinities seem to be controlled when brought within the influence of vital agencies, yet modern physiological chemists have shown that the influence of remedies, acting in a great measure according to chemical laws, extends much beyond what was formerly admitted. Mialhe, indeed, so long ago as the year 1841, stated that he would one day demonstrate by experiment,—"That for an internal remedy to have a general action on the organism, it must be soluble, or susceptible of becoming so, by reason of chemical changes taking place in the interior of our organs."—See above and his "L'Art de Formuler." Or, as it is now difficult to procure this work, see "Brit. and For. Medico-Chir. Rev.," vol. iv. p. 128. The truth of this axiom is now very generally admitted. But as space cannot be spared for entering on this subject, some of the results arrived at by different observers will be given under the heads of the separate groups which come under this division.

Escharotica. Caustica.

Escharotics (from ἐσχαρέω, to form an eschar), usually called Caustics, are employed for destroying the vitality of the part to which they are applied. They are occasionally called *Potential Cauteries*, to distinguish them from the Actual Cautery, or great heat applied through the medium of heated metal, or of Moxa, used for the same purpose. Concentrated acids and alkalies destroy the vitality of a part by forming a chemical union with one or more of the constituents of the animal body, from which some of them may afterwards be separated by presenting to them agents which have greater affinities for the solvent.

Mialhe distinguishes as *Coagulating Caustics* those which, by combining with the tissues of the body, form insoluble compounds, such as the mineral acids, the chlorides of antimony, of zinc, and of gold, the chloride of mercury, the nitrates of silver and of mercury, the sulphate and acetate of copper, creasote; while those which produce soft and gelatiniform compounds, he calls fluidifying caustics, which are equivalent to the liquefacients of Dr Pereira, as the solutions of potash, of soda, and of ammonia, arsenious acid, hydrated phosphoric acid, oxalic acid, &c. The strong acids and alkalies have the disadvantage of being in a liquid form, and thus spreading beyond the part to which they are applied, though they have in other cases the advantage of following a poison into all the sinuosities of a wound. Dr Bennett, in his work on inflammation, &c., of the neck of the uterus, states the nitrate of silver to be more useful, though less energetic; and the *Potassa cum calce*, as made into cylinders by Mr Squire, is found both powerful and manageable. Of the acid caustics he prefers the Pernitrate of Mercury, though it has the disadvantage of being apt to spread. To the list of caustics are added a few which are milder in their action, and which are useful in producing a healthy stimulant action in ulcers, &c.

Acids—Sulphuric, Nitric, and Acetic.
Arsenious Acid: sometimes used in cancer.
Nitrate of Mercury.
Potassæ Liquor.
Potassæ Hydras.
Potassa cum Calce.
Potassæ Carbonas.
Calx recens usta.
Calcis Hydras.
Ammoniæ Liq. fortior.
Alumen exsiccatum.
Tinct. Ferri Perchloridi.
Zinci Chloridum.
Liq. Antimonii Terchloridi.
Argenti Nitras.
Cupri Sulphas.
Cupri Diacetas.
Linim. Æruginis.
Cupri Ammonio-Sulphas.
Hydrargyri Suboxidum (Black Wash).
Hydrargyri Oxidum (Yellow Wash).
Hydrargyri Chloridum.
Hydr. Iodidum.
Hyd. Nitras Acidum.
Ung. Hydrarg. Nitratis.

ACIDA. *Acidulæ.*

Acids have long been ranked among chemical remedies, their mode of action when employed as medicines being in many instances obviously the same as when acting out of the body. Acids in a concentrated state, it is well known, act as Escharotics, from their strong attraction for some of the constituents of animal structure. But when moderately diluted this is not so obvious, for when applied to the skin or any mucous membrane, a pungent sensation, accompanied with some astriction, is experienced, and the blood is repelled from the capillaries. These effects are often followed by stimulant reaction. So, taken internally, they dissolve the epithelium scales, and act as corrosive poisons, but when much diluted, a sensation of coolness, though when less diluted, a tonic effect, is experienced. But such powerful agents cannot come in contact with the solids and fluids of the body without producing some chemical effects. In the stomach and upper part of the intestinal canal, they will meet with an acid state of the secretions, and becoming absorbed into the blood, they must enter into combination, for this fluid does not lose its alkaline character. In the alimentary canal they will neutralise the naturally alkaline state of the secretions, in either case depriving the system of alkaline matter, and forming salts which are for the most part excreted in the urine: in some cases rendering this acid, but it is well known that this secretion is more readily affected by alkalies than by acids, and a considerable difference has been observed between the vegetable and the mineral acids. The latter, with the exception of the phosphoric, when diluted form insoluble compounds with albumen and fibrine by coagulating albumen. The vegetable acids, though they equally rob the system of alkaline matter, and some become partially oxidised, yet usually reappear in the urine as super-salts; dilute acetic, oxalic, and tartaric acids dissolve the capsules of the mucous corpuscles. In late experiments it has been found more easy to acidify the urine with the vegetable than with the mineral acids. Vegetable acids combine partly with alkalies, and become partly oxidised in the blood, especially when presented in the form of salts of the vegetable acids, so that Wöhler has observed that the free vegetable acids rob the system of alkaline matter, but that the salts of the same acids deprive the system of oxygen.

Mialhe says there is much greater danger in administering acids than there is in giving alkalies; for the natural secretions of the system being generally alkaline, it is not so easy to disturb their condition by the use of alkalies, as it is by that of acids. He states, moreover, that if natural alkaline fluids become neutralised, or, what is worse still, if they become acid, then functional disorders will result; for the vital fluids are no longer enabled to produce the necessary interstitial changes, and though the economy may struggle for some time against this condition, yet it must ere long yield to it, and debility, wasting, together with such serious disturbances as pyrosis, gravel, gout, scurvy, or diabetes may result. Besides the above uses, acids are employed as Refrigerants, Astringents, and Tonics, and will therefore be mentioned again under these several heads. Dr O. Rees recommends Lemon Juice in Rheumatic Fever.

Acidum Sulphuricum Dil.
Acidum Sulphuricum Aromaticum.
  Potassæ Bisulphas.
Acidum Phosphoricum Dil.
Acidum Nitricum Dil.
Acidum Hydrochloricum Dil.
Acidum Nitro-Hydrochloricum Dil.
Acidum Carbonicum.
  in Carbonic acid water.
Acidum Oxalicum.
Binoxalate of Potash.
Oxalis Acetosella, and Rumex Acetosa.

Acidum Citricum.
  Limonum Succus, Lemonade.
Acidum Tartaricum.
  Potassæ Bitartras.
Acidum Aceticum.
Acidum Pyroligneum.
Acetum Pyroligneum.
Acetum Destillatum.
Syrupus Aceti.
Acid Fruits.
Vine Juice. Tamarinds.

ALKALINA. *Alkalies. Antacida.*

Alkalies, or Alkaline Earths and their Carbonates, introduced into the stomach, will there counteract the natural acidity of the gastric juice, or neutralise any acid that may be due to the nature of the food, or is the result of diseased secretions in the alimentary canal, n the same way that they would do out of the body. In diminishng acidity, they at the same time allay irritation; when a little in excess, they produce some stimulant effect on the stomach, but their continued use is necessarily injurious in neutralising the healthy degree of acidity. In the intestinal canal they will be less so, because only adding to what is there the natural alkaline state of the secreions. Absorbed into the blood, they will increase the proportion f alkaline matter, and carried round by the circulation, they will iminish the acidity of secretions, as, for instance, that of perspiraion as well as of the urine, and in the one case allay the irritation of nd remove some cutaneous eruptions, as in the other they frequently control the deposition of lithic acid.

They are considered by some to increase the fluidity of the blood by diminishing its proportion of fibrine, and were hence included among his class of Liquefacients by Dr Pereira. "It is on the account of the influence of liquefacients in checking phlegmonous inflammation, obviating its consequences, and promoting the removal of enlargements, indurations, &c., that they are frequently denominated resolvents." In poisoning by acids, they can be used successfully in counteracting their effects, but it must not be forgotten that some of them possess as corrosive powers as the poisons they are intended to counteract, though it is not usually necessary to present these in large quantities, for chalk, magnesia, and the milder bicarbonates and carbonates are fully efficacious. Applied to the surface in a diluted state they diminish the irritation of some eruptions, while weak alkaline solutions, applied in soaked pledgets over the swelled joints in rheumatic fever, are found to relieve, probably by being absorbed, and diminishing the acid nature of the secretions.

Mialhe has observed that as the normal alkalinity of the fluids is necessary for the decomposition and assimilation of amylaceous substances, and probably for the absorption of fatty substances, so the employment of alkalies, generally useful, is injurious to those whose vital fluids are already supersaturated with them. Dr Golding Bird has particularly called attention to the depurating effects of alkalies, their carbonates, and of such salts as the Acetates, Citrates, and Tartrates, which, in the system, are converted into carbonates. He believes that the action of Potash in the system is similar to its effects out of the body in dissolving such protein compounds as albumen, fibrine, &c. He states that 3 drachms of Acetate of Potash, given in divided doses, within the 24 hours, caused an increase in the amount of solid matter from 416 grains, the normal quantity, to 782 grains, and that not only was the acetate converted into carbonate, and a large proportion of matter metamorphosed into Uric acid and Urea, but "the greatest increase was in that mixture of organic products set down as extractive, and consisting chiefly as creatine, creatinine, uroxanthine, and matter rich in sulphur." He also believes that the solvent power of the alkalies is exerted with the greatest energy on those tissues which are diseased, or are low in the scale of vitality. Dr Bence Jones has further ascertained that Tartrate of Potash in large doses produces the most marked effect on the alkalescence of the urine; 120 grains of pure dry Tartrate of Potash, dissolved in 4 ounces of Distilled water, making the urine alkaline in 35 minutes. Notwithstanding that practitioners have been in the habit of employing alkalies, and their carbonates, and that experimentalists have made the urine alkaline by giving them, Dr Gairdner, in his work on Gout, objects to their use as in most cases inefficacious. He states that 30 gr. doses of the alkaline phosphates, citrates, or tartrates, frequently repeated, assuage the general irritation, and cause the disappearance of the Uric acid from the Urine, when this had resisted all change from the employment of carbonates. Alkalies, besides their caustic effects, are used, especially Ammonia, as Rubefacients, and likewise as Alterative stimulants. Potash is preferred to Soda as forming soluble salts, and Ammonia used when a stimulant is required with an antacid. Magnesia is useful as a laxative antacid, and the calcined preferred to the Carbonate when we wish to avoid the extrication of gas. Chalk, sometimes called an absorbent, is useful in diarrhœa, from its apparently astringent effects, but which are no doubt due to its neutralising acid, and thus diminishing irritation. Soap is selected as an ingredient in pills with some resinous cathartics in sluggish states of the intestinal canal.

Ammoniæ Liquor.
  Spir. Ammoniæ.
Carbonate of Ammonia.
  Spir. Ammoniæ.
  Spir. Ammoniæ arom.
  Spir. Ammoniæ fœtidus.
Ammoniæ Carbonas.
Ammoniæ Bicarbonas.
Potassæ Liquor.
Potassæ Carbonas.
Potassæ Bicarbonas.
  Liq. Potassæ effervescens.
Sodæ Carbonas.
Sodæ Liquor.
Sodæ Bicarbonas.
Trochisci Sodæ Bicarb.
Liq. Sodæ effervescens.
  Sapo durus.
Calcis Liquor.
Carbonate of Lime.
Creta præparata
Testæ præparatæ.
Mistura Cretæ.
Trochisci Cretæ.
Pulv. Cretæ Aromaticus.
Pulv. Cretæ arom. c. Opio.
  Hydrargyrum cum Creta.
Magnesia.
  Pulv. Rhei Comp.
Magnesiæ Carbonas.
  Mist. Camphoræ c. Magnesia.
Bicarbonate of Magnesia.
    or Soluble Magnesia.
  Hydrargyrum cum Magnesia.
Alkaline Mineral Waters, as of Malvern, Vichy, &c.
Some Oxides of Metals, as of Zinc.
Oils also act as Antacids.

The Acetates, Tartrates, and Citrates of potash and soda, being converted into carbonates, are extremely useful as antacids in the system.

ANTILITHICS. *Lithontriptics.*

Antilithic (from ἀντὶ, against, and λίθος, a stone) is preferable as a name to Lithontriptic, and is applied as a general term to remedies which counteract the tendency to the deposition of urinary sediments or calculi. The urine, compound in nature, is very variable in the proportion of its constituents. In a state of health, it is acid from the presence, according to some chemists, of Superlithate of Ammonia, while others think that the Lithic or Uric acid is combined with Soda, and a third set, that the acidity is due to an acid phosphate of Soda. Dr Bence Jones has ascertained that the urine is more acid when the stomach is empty than when it is employed in the act of digestion. It then not only loses its acidity, but in some cases becomes alkaline. But there may be, and frequently is, an excess of acidity, not only in the urine, but in other secretions, owing to irregularities of diet or to disorders of the digestive functions; sometimes owing to a check to the functions of the skin. In such cases, called Lithic acid diathesis, a deposit takes place of a reddish powder, or rather of minute crystals of Lithic (also called Uric) acid, or sometimes only of Urate of Ammonia, which may be dissolved by alkalies or dissipated by heat. In the last case, the deposit may not be due to any excess of acid, but rather to a deficiency of other ingredients which assist the solubility of the Urate of Ammonia, and therefore require diluents or soda water rather than powerful antacids. In other cases, white earthy deposits, which cannot be dissipated by heat, are observed. These are due to a portion of the phosphatic salts contained in the urine, and which are deposited when the urine becomes alkaline in nature. They consist of the Ammonio-Magnesian Phosphate or the triple Phosphate of Ammonia and Magnesia, with some Phosphate of Lime, and constitute what is usually called the Phosphatic diathesis. In another condition, called Oxaluria, there are deposits of octohedral crystals of Oxalate of Lime, and, under more varied circumstances than was formerly thought, that is both with lithic acid, the lithates, and the phosphates. So that it has been inferred that it does not always indicate structural disease, but often disorder of the digestive functions.

Attention to diet; vegetable food in some cases, meat in others. Exercise. Baths. Attention to the skin. Diluents, water distilled or mineral, but pure. Alteratives. Diaphoretics. Tonics.

In *Lithic* acid diathesis. Antacids (q. v.) are indicated.

Potassæ Liquor. Potassæ Carbonas et Bicarb. Liq. Potassæ effervescens.

Soda and its Carbonates. Soda exsiccata, and Liq. Sodæ effervescens. Sapo durus. Waters of Vichy and other alkaline mineral waters.

Lithia, its Carbonate, and Citrate; Liquor Lithiæ effervescens.

Ammonia and its Carbonates; Stimulant, and act as antacids in the stomach.

Effervescing saline draughts produce an alkaline reaction in the urine.

Potash and its Carbonates are more eligible than Soda, because the lithate of Potash is more soluble than that of Soda.

Calcis Aqua. Creta præparata. Testæ præparatæ.

The Tartrates, Citrates, and Acetates being converted into Carbonates, act readily in rendering the urine alkaline.

Magnesia and its Carb. Magnesia water. The Bicarb. with excess of Car′.

The Phosphate and Benzoate of Ammonia are useful as solvents of Lithic acid.

The Phosphate and Biborate of Soda are also employed in similar cases.

Colchicum and Mercury both diminish acidity of the urine.

Tonics and vegetable bitters are required, with nourishing diet. Wine and opium. Avoid everything depressing.

In the *Oxalic* diathesis, the Nitric′, or better the Nitro-hydrochloric, with Tonics, and Meat, and nourishing farinaceous diet.

In the *Phosphatic* diathesis an acid is indicated.

Nitric′ and Hydrochloric, also Phosphoric acid and Dil. Sul′. Mr Ure has particularly recommended Benzoic acid and soluble Benzoates. Carbonic′.

Vegetable acids. Vinegar, and Tartaric acid render the urine acid more readily than the mineral acids.

Local Lithontriptics, as injecting very weak Nit′ into the bladder; or a weak alkaline solution, or simply pure water. Electro-chemical action. Lithotrity. Dr E. Hoskins (*see* Phil. Trans. 1843) recommends the introduction of weak solutions of chemical decomponents (as the Nitro-saccharate of lead) instead of solvents, into the living bladder.

REFRIGERANTS, *see* p. 798.

DISINFECTANTS. ANTISEPTICS.

Disinfectants are substances suited to free the air of buildings and of rooms, as well as infected bodies in general, of the invisible, mostly imperceptible, sometimes very odorous particles, whether arising from putrescent matter or from miasmata, and which are the source of infection and propagate disease. Some of the means employed for this purpose are purely mechanical, but are not less effectual as insuring ventilation and a free supply of pure air. Great heat destroys the infectious matter of some diseases, while some chemical agents destroy the offensive odour of many effluvia, and have hence been inferred to have the power of rendering miasmata inert. Fumigations and Pastils, Balsamic Resins, Aromatic Vinegar, though diffusing agreeable odours, are often worse than useless, from concealing, and thus diverting attention from the sources of effluvia. Antiseptics, as Carbolic acid, are chemical agents which prevent the decomposition of organic structures, whether vegetable or animal, usually by forming a chemical combination with one or more of their constituents. At other times great cold, great dryness, or the exclusion of air, will enable such substances to be preserved. Charcoal is occasionally applied to foul ulcers, or given in a fœtid state of the breath or of the secretions.

- Ventilation.
  - Great heat.
  - Diffusive Gases which act chemically, especially Chlorine.
  - Liq. Chlori.
  - Liq. Sodæ Chloratæ.
  - Calx. Chlorata.
- Acid fumes, as of Sulphurous and Hydrochloric acid gases.
- Nitrous acid fumes: Acetic and Pyroligneous acids are less effective.
- Destruction of infected matter and odours by great heat, by application of Quicklime, and of Charcoal.
- Zinci Chloridum (Burnett's).
- Pyrolignite and Perchloride of Iron (Ellerman's).
- Plumbi Nitras (Le Doyen's).
- Plumbi Acetas.

Antiseptics.

- Chlorine.
- Mineral acids.
- Arsenious acid.
- Chloride of Mercury.
- Salt.
- Nitre.
- Alum.
- Chloride of Lime.
- Sulphate of Iron.
- Alcohol.
- Carbolic acid.
- Creasote.
- Tannin.
- Sugar.
- Empyreumatic Oils.

ASTRINGENTIA. *Astringents.*

Astringents are remedies which have the power of corrugating or of producing a contraction of the muscular fibres of the part to which they are applied, as well as of coagulating or precipitating albuminous fluids. The possession of astringency in any substance is easily recognised by its having the property of corrugating the papillæ of the tongue when tasted ; but otherwise there is no principle common to the whole, some being mineral acids, others metallic salts, with the earthy salt alum, while many are obtained from the vegetable kingdom ; but all have the power of coagulating albumen. The first effect of an astringent (then called Styptic) is visible when brought into contact with a bleeding wound, in the contraction which stops the bleeding from small vessels, by constricting the muscular fibre of their coats. In this way, when applied to mucous surfaces, they diminish secretion. That their effects are due to chemical action is evident from similar effects being produced on dead animal matter, as is seen with many of the astringents in the act of tanning. But, like other chemically acting remedies, they have a further action, by diminishing relaxation and thus giving a tone to the stomach, and thence, acting dynamically, they produce a powerful effect on the system. They thus obviate general debility, act as permanent stimulants, and assist in curing intermittents, though their first effects appear of so local a nature. Some are, no doubt, absorbed into the blood, and making the circuit of the circulation, produce their constringing effect on the capillaries, and passing through glands with the secretions, they may there also produce some of their effects. Of the Mineral Astringents, Sulphuric acid and Alum are the most powerful: the Acetate of Lead is very useful in the same class of cases, but these cannot be prescribed together, as Sulphate of Lead would be produced. The system is apt to suffer from the poisonous effects of Lead, if long continued, but the blue line, as observed by Dr Burton, at the edge of the gums, is an indication of the necessity for intermitting the drug.

Of the Vegetable Astringents, the Tannic and Gallic acids are the most powerful, the former for external and the latter for internal exhibition. The different vegetables chiefly owe their efficacy to the presence of the first of these acids, which coagulates albumen, though Gallic acid does not do so. But M. Pelletier having found that a mixture of a solution of Gallic acid with one of Gum will precipitate albumen, Dr Headland has thence inferred, that Gallic acid may unite in the blood with a saccharine matter which is similar in composition to gum, and "by this acquire chemically an astringent power, which it is not able to exert on external parts, because then isolated. But the saccharine matter is required in the system for special purposes, and thus Gallic acid passes out with the secretions alone."

Astringents are thus employed externally to obviate relaxation, and to stop hæmorrhage from small vessels. Internally, to give a tone to the stomach in cases of Dyspepsia and of Debility, to control inordinate discharges of hæmorrhages from the different viscera, and sometimes to cure intermittents in conjunction with some aromatic.

Cold. Cold Water. Freezing Mixtures. Quietude.
Acids, mineral as medicines; vegetable, diluted as drinks.
Alumen. Liq. Aluminis comp., with Sulph. Zinc.
Acid. Sulph. dil. Acetum. Refrigerants.
Cataplasma Aluminis. Borax.
Plumbi Acetas. Ung.
Pil. Plumbi cum Opio.
Plumbi Subacet. Liq., et L. dilutus.
Zinci Sulphas. Zinci Acetat. Tinct.
Ferri Sulphas. Tinct. Ferri Perchloridi.
Ferri Pernitratis Liquor.
Cupri Sulphas. C. Ammonio-Sulphas, et Subacetas.
Calcis Aqua. Creta præparata.
Zinci Carbonas, et Hydrargyri Ammonio-Chloridum, externally.
Tannic and Gallic acids.
Hæmatoxylon, Dec. et Extr.
Krameria, Inf. et Extr.
Catechu. Inf. Pulv. Comp. Tinctura, Trochisci.
Kino. Tinct.; et Pulv. Kino cum Opio.
Granatum. fructus cortex.
Prunus spinosa.
Tormentilla. Bistorta.
Quercus Cortex, Dec.
Gallæ: Tinct. Ung. et Ung. Gallæ c. Opio.
Rumex aquaticus. Geum. Lythrum

Rosa gallica, Conf. Syr. Mel and Inf. comp. with Dil. Sulphuric acid.
In Hæmorrhages: Styptics, Compresses, Plugs.
Matico. Agaric. Creasote. Opium c. Plumbi Acet. Ergot in Uterine Hæmorrhage.

ANTIDOTES, *see* Table, p. 803.

C. VITAL AGENTS.

This division, introduced by Dr Young, has been adopted by Dr A. T. Thomson, and includes the remainder of the groups of medicinal agents, which are considered to act more especially upon the living structures; that is, the muscular, sanguineous, and secerning systems, and all as dependent upon the nervous system. But, as we have seen, with the mechanical and chemical—though a portion of the effects of the medicinal agents may be considered strictly to be of the nature of the divisions under which they are placed, yet other effects are as properly dynamical—so with this division of vital agents, some of their effects are undoubtedly due to the chemical agencies of the respective remedies. They however differ very much from each other in their several modes of action. The subdivision of Evacuants, for instance, acts chiefly upon glands and the secerning system. Among these we have placed the class of Alteratives. Others act directly upon the nervous system, either increasing or diminishing nervous force, though the class of Tonics are considered by some to act on the muscular and sanguiferous systems.

1. EVACUANTIA. *Evacuants.*

The groups of remedies placed under this subdivision, cause increased secretion or evacuation from different organs. They were separated by Dr Murray from General Stimulants under the title of *Local Stimulants*, for which Dr Paris suggested the name of Special Stimulants. Dr Pereira includes them under the head of *Eccritica*, and Dr Headland most of them under that of *Eliminantia*. The majority increase secretion, and are themselves excreted; but this they cannot do without producing alterations in the fluids and solids of the body, and therefore the class of remedies usually called Alteratives may most fitly be united with them. As increased secretion is usually followed by more or less of exhaustion, some of them are frequently employed to lessen the mass of circulating fluid, or to relieve one organ by causing a determination to another. Hence some of them always form a part of antiphlogistic treatment. The Rubefacients, however, except when used as vesicants, do not produce an increased secretion, but they relieve internal affections by causing a determination to the surface, and thus act on the same general principle.

ALTERANTIA. *Alteratives.*

The term *alterative*, so commonly employed, is differently interpreted by different authors. Müller includes under it all such remedies as are neither stimulant nor sedative, and have the power of effecting changes in the state of the living solids, and consequently in the functions which they perform. The term is, however, usually applied to such as, taken in comparatively small doses, and continued for some time, by degrees and almost without any perceptible effect, produce changes in the secretions and in disordered actions. Others consider them as stimulants which act specially upon particular glands and upon absorption in general. Bouchardat defines alteratives as medicines which are absorbed, and which act by modifying in a permanent manner the motions of the blood and of the different secretions. This makes them nearly to coincide with Dr Headland's subdivision, Catalytica, of Hæmatica, or blood-medicines, all of which "act while in the blood, which they influence;" but the Catalytics "act so as to counteract a morbid material or process, and must pass out of the body."

Under the head of Alteratives are included Iodine, Mercury, Gold, occasionally some other metals. The Chlorides of Barium and of Calcium were formerly much used, as the Alkalies still are. In alterative treatment is usually included the taking of various decoctions, as of the *woods*, or of substitutes for them in the form of the Decoctions of Sarsaparilla and of Guaiacum, which, taken with large quantities of water, must operate chiefly by their diluting and solvent properties, and partly by the stimulant, perhaps alterative effect, of the active principles of the several ingredients in these diet drinks, which, though small in quantity, must be absorbed and conveyed into the capillaries.

As Iodine and the metals are insoluble, Mialhe has inferred that the latter become oxidised by the fluids of the stomach, and are then converted into chlorides, or double chlorides, and becoming soluble are absorbed into the circulation; that Iodine and Bromine seize on the alkalies contained in the fluids, and are changed into Iodides and Bromides, and are afterwards excreted. He conceives that the mercurial preparations are reacted on by the solutions of the alkaline chlorides, either with or without the access of atmospheric air; that they thus give rise to the production of some corrosive sublimate; that corrosive sublimate and albumen form a compound which is insoluble in water, but which in its hydrated state is soluble in the alkaline chlorides; and that it is in this form that mercury gains access to the circulation. He recommends that the Bichloride (*Chloride*) be administered in small doses, as from $\frac{1}{10}$ to $\frac{1}{2}$ of a grain daily, and that it should be given in solution with a little common salt and Sal Ammoniac, as these keep the Bichloride soluble, and prevent it from acting on the tissues of the alimentary canal. Bouchardat, however, conceives that this is attributing an exaggerated importance to the Chloride of Sodium, and that the principal solvent of metallic preparations is the Chloride of Ammonium or Sal Ammoniac, which, he says, he has frequently found in the digestive apparatus of animals.

Mercury, in some of its preparations, acts as an irritant. (*See* Local and Special Stimulants, Escharotics, Errhines, Cathartics.)

But when some of its suitable preparations, as Blue or Plummer's Pill, or Corrosive Sublimate, are prescribed in small doses, with considerable intervals, or every night or so, there is by degrees perceived an improvement in the function of digestion, as well as in the evacuations, with a softer state of the skin. If larger doses are given, or more frequently, some excitement in the circulation may be observed, as well as in the absorbent system, and in the several secretions, as is instanced in the stimulation of the liver, the kidney, and in the healthful perspirable state of the skin. The less observable effects dependent on smaller doses, spread also over a greater space of time, will produce that alteration in disordered actions, so as to cause an improvement in the digestive and nutrient functions, the disappearance of eruptions, and the removal of thickening of the skin or of other tissues. A greater degree of the same action will diminish the plasticity of the fibrine of the blood, promote the absorption of glandular enlargements, or of indurated structures ; and thus the deobstruent effects of Mercury will be obtained. All this may be short of the constitutional effects, indicated by fœtor of the breath, redness of the gums, followed by salivation, often very profuse, and even by ulceration ; but often the beneficial effects are only observed when some of these phenomena display themselves, though in a very slight degree. These effects, or Mercurialism, as the state is called, may be produced either by repeated small doses, by one or two larger ones, by rubbing Blue Ointment into the skin, or using the Mercury in the form of fumigation. But many deleterious consequences follow from the unadvised use of Mercury and its preparations.

Iodine, like Mercury, will, in concentrated doses, act as an irritant on the surface to which it is applied. Hence some of its preparations are poisonous. But if it be taken for some time in small doses, the stimulant effects are observed in the increased perspiration, often in the improved secretion of bile, as well as of urine ; while the mucous membrane of the nostrils becomes inflamed, as in catarrh. But the characteristic phenomenon in the action of Iodine is the promotion of absorption, hence the disappearance of syphilitic nodes, of glandular enlargements, as in the case of Goître, or even of healthy glands, as of the mammæ and testicles under its long-continued use. Other symptoms observed are included under the term Iodism, which, in addition to some of the foregoing, is especially characterised by giddiness and headache, nausea, restlessness, weakness, and emaciation, with a weak but frequent pulse. It ought to be intermitted for a time on the first appearance of any of these symptoms. In the Iodide of Iron the alterative effects of the Iodine are combined with the tonic effects of the Iron.

Bromine and the Bromide of Potassium, perhaps also Chlorine, may be used for many of the same purposes as Iodine. (The Bromides of Potassium, Ammonium, and Iron, exert also a sedative power over the nervous system.) The preparations of Gold, as the powder, and the Chloride of Gold and Sodium, or the Terchloride, are likewise stimulants of the absorbents, and may, with great benefit, be used in Scrofula and Secondary Syphilis.

Arsenious acid, mentioned also as an antiperiodic, under the head of Tonics, is usually prescribed in the form of Liq. Potassæ Arsenitis, sometimes in that of Liq. Ammoniæ Arsenitis. Sodæ Arsenias and Ferri Arsenias are much used on the Continent. De Valangin's mineral solution, a preparation esteemed by some, is composed of a Terchloride of Arsenic. Arsenic is a powerful alterative in many skin diseases, especially Lepra and Psoriasis, but also in others, as Eczema and Lupus. Mr Hunt, who has employed it much in such affections of late years, recommends commencing it in full doses of from ♏iij.-♏v. of Fowler's solution. It is generally discontinued when the symptoms of accelerated pulse, weakness, and itching of the eyes, griping, restlessness at night, or a great feeling of weakness and lowness of spirits are experienced. Mr H. recommends diminishing the dose, and continuing the medicine, so as not to lose its effect in some of these obstinate diseases. Sulphur, Pitch, and Tar are used as alteratives in similar affections. Antimonial preparations, and especially the combinations with Sulphur, are also frequently used as alteratives in skin diseases.

Before the discovery of Iodine, the Chlorides of Calcium and of Barium were most frequently employed as stimulants of the glandular and lymphatic systems, and were formerly much in vogue in scrofulous diseases, in Bronchocele and other glandular complaints, as well as in chronic skin diseases. The Alkalies also, as Liq. Potassæ and the Carbonates, when taken for some time, besides the effects described under the head of antacids, as dissolving the fibrine of the blood, produce many of the same effects as Iodine, &c., in removing glandular swellings. They are supposed to diminish the consistence of the blood, rendering it more watery, and reducing the habit to a state resembling scurvy. Dr Pereira proposes the term of Liquefacients, as synonymous with the *verflüssigende mittel* of Sundelin, for medicinal agents which augment the secretions, check the solidifying, but promote the liquefying, processes of the animal economy, and which by continued use create disorder in the functions of assimilation.

Cod-liver oil has of late years been one of the most extensively employed of alteratives, and is no doubt very beneficial in cachectic habits, improving the secretions and fattening, at the same time that the condition of the system is improved.

Mercurials.—Hydrargyri Pil. Hyd. c. Creta. Hyd. c. Magnesia. Ung. Hydrargyri Linimentum, with Camphor and Liq. Ammoniæ. Emp. et Emp. Ammoniaci c. Hydr. Hydrarg. Oxidum.

Hyd. Iodidum Viride. Hyd. Iodidum rubrum et Ung.

Hydrarg. Subchloridum (Calomelas.) Pil. comp., with Sulphurated Antimony and Guaiacum. Ung.

Hydrarg. Chloridum, et Liq., with Sal Ammoniac.

Hydrarg. Sulphuretum and Sulphuretum c. Sulphure, for fumigations.

Hydrarg. Nitratis Ung. et Liquor Acidus. Ung. Hyd. Ammoniati.

Iodinium. (Iodum.) Iodide of Starch. Linimentum, Tinct. et Ung., with Iodide of Potassium.

Potassi Iodidum. Ung. Emplastrum, &c.
Ferrii Iodidum et Syr. Plumbi Iodidum. Cadmii Iodidum.
Burnt Fuci, or Sea-weeds. Burnt Sponge. Cod-Liver Oil.
Brominium. Potassii Bromidum. Ammonii Bromidum. Bromide of Iron.
Acidum Arseniosum. Liq. Potassæ Arsenitis. Liq. Arsenici Hydrochloricus. Iodide of Arsenic and Mercury. Sodæ Arsenias. Ferri Arsenias.
Alkalies, &c.—Liq. Potassæ. Potassæ Carb. Potassæ Bicarbonas.
Calcis Aqua. Calcis Chloridi Liquor.
Barii Chloridi Liquor.
Auri Pulvis. Chloride of Gold and Sodium.
Acid. Nitro-hydrochloricum. Antimonium Sulph. Tartar Emetic.
Mild Vegetable Alteratives. Sarsa. Dulcamara, et Inf. Hemidesmus.
Taraxacum. Succus. Dec. et Extr. Rumex aquaticus et Hydrolapathum. Ulmus.

ERRHINA. *Errhines. Sternutatories.*

Errhines (from ἐν and ῥίν, the nose) include all medicines which are applied to the mucous membrane of the nostrils. The term of Sternutatories is restricted to those which cause sneezing. Errhines may be applied in a dry, soft, liquid, or gaseous state. They may be Emollient, Astringent, or Stimulant—the first sheathing irritated surfaces, the second restraining inordinate secretion the consequence of relaxation, and the third favouring the natural mucous discharge on the return of the secreting surface to a healthy state. Though generally local in their effects, they often afford aid by revulsion in chronic affections of neighbouring parts. Sternutatories are obtained both from the mineral and from the vegetable kingdom.

Aromatic Errhines.—Powdered leaves of Labiatæ, as of Melissa, Lavandula, Rosmarinus, Origanum. Teucrium Marum is often called Headache-plant. Powdered Iris-root. Asarum. Pulv. Asari comp. with Lavender flowers.
Ammonia and its Carbonates. Acetic acid, &c. Tabacum as Snuff.
Acrid Substances, as Veratrum album. Veratria. Euphorbium. Hydrargyri Subsulphus flavus. All act as Sternutatories, but must be mixed with some mild powder. The fumes of the Red Iodide of Mercury.

SIALAGOGA. *Sialagogues.*

Sialagogues (from σίαλον, and ἄγω, to drive) are medicines which increase the secretion of saliva. This may frequently be effected by chewing a nearly inert substance, such as mastic, or an astringent and stimulant, like the Catechu and Areca nut, wrapped up in a leaf of Piper Betel of the East, or the Tobacco of America and Europe, or by the use of acrid, or spicy, or warm stimulant substances. Salivation may also be induced by the secondary effects of Nauseants, or produced by the action of Mercurials; when not only is the secretion increased, but the medicine itself is excreted. They may be useful from their local or from their derivative effects in affections of the head and face.

Acrids.—Sinapis. Armoracia. Pyrethrum. Mezereon. Iris-root. Angelica.
Spices.—Zingiber. Piper nigrum et album. Capsicum. Mastiche.
Astringent.—Catechu. *Astringent and Purgative.*—Rheum.
Stimulants.—Applications of Oil of Cloves and of Creasote, &c.
Mercurial Preparations, see Alterative Stimulants.

EMETICA. *Emetics.*

Medicines which evacuate the stomach by vomiting—an act caused partly by irritation induced on the stomach, and partly by influence produced on the brain and nervous system. The latter form we see in the reflex action produced by tickling the fauces with a feather. The influence of the brain we see in sea sickness, and, also, in the difficulty with which Emetics act in narcotic poisoning or drunkenness. Emetics differ much among themselves, some acting only when introduced into the stomach; others, as Tartar Emetic, if applied to any other part of the body, so as to be absorbed into the system. The effect is not altogether dependent upon the nature of the substance, for Ammonia and Mustard, which in small doses act as Stimulants, and Sulphates of Zinc and Copper as Tonics, in large doses evert the action of the stomach, and produce an emetic effect, generally quickly, and without debilitating the system. Others act more slowly, and produce long-continued nausea, and the depressing symptoms which accompany such a state, and which favour absorption. These, therefore, as well as from their slow action, are not suited to cases of poisoning. With both, the act is accompanied by a series of concussions which favour the excretion and secretion of the biliary, pancreatic, and intestinal fluids, with a determination to the skin. This very concussion makes them dangerous when there is a determination to the head, or in advanced stages of pregnancy, in Hernia, &c. But they are useful before the accession of an intermittent, also in bilious Fever, in Asthma, Hooping-cough—or merely for the purpose of evacuating the stomach.

Direct Emetics, acting quickly.—Ammonia Liq. (f℥ß–f℥j. taken in a glass of cold, followed immediately by some warm, water). Sodii Chloridum.
Zinci Sulph. Cupri Sulph. Cupri Ammonio-Sulph. Ærugo.
Sinapis nigra. Sinapis alba. Pure Flour of Mustard.

Indirect Emetics.—Antimonii et Potassæ Tart. (Antimonium Tartaratum.) Vinum or Antimonial Wine.
Antimonii Oxidum. Sulphuretum.
Ipecacuanha. Pulv. Vin. et Syr. Emetine. Viola odorata.
Scilla, Pulv. Tinct. et Syr. Asarum and Euphorbium, but both too acrid.
Anthemis, Inf.; assists vomiting.
Tabacum; Lobelia inflata; but both are unsafe as Emetics.

Ipecacuanha and Tartar Emetic are often combined together, or the latter may be prescribed with a Cathartic, forming an Emeto-Cathartic.

EXPECTORANTIA. *Expectorants.*

Expectorants are medicines which are supposed to have the power of favouring the expulsion or the secretion of mucus (*ex pectore*) from the organs within the chest; that is, from the secreting surface of the trachea, and from cells and passages of the respiratory organs. These, like other groups of medicines, are *relative* agents: that is, their action bears a relation to, or depends upon the nature of the case, the state of the patient, the period of the disease, &c. Thus, in a state of excitement, with dryness of the skin, &c., Venesection, Warm-bath, Nauseants, and Demulcents, may be useful, and also some narcotics for allaying irritation and diminishing spasm. In other cases, where there is a deficiency of action, or, with sufficient secretion, a deficiency of power to expel the mucus or other matters which may have been secreted, stimulants are found to be necessary. We may employ some in the form of lozenges, which, coming in contact with the upper part of the trachea, may have their effects propagated by sympathy ; or we may make use of others in the gaseous form. Some taken internally, are absorbed into the blood, and carried round to the mucous surface of the lungs, where they produce their stimulant effects, and are excreted, and may be smelt in the breath. Tonics may be useful in many cases by improving the state of the constitution, and restoring to a healthy condition the secretions in general, and among others, that of the bronchial passages, with the healthful power of expectoration.

Emetics acting mechanically favour expectoration.—Sulph. of Zinc, or of Copper, or Carb. of Ammonia.

Demulcents and Refrigerants, by allaying irritation, and by obviating a dry state of the skin, favour expectoration.

Inhalations of warm Water, and of Demulcent Decoctions. Warm Baths. Pediluvia, by relaxing the skin.

Gummy Substances internally.—Isinglass. Jujubes. Pâte de Guimauve. Liquorice. Quince and Linseed, &c.; see Demulcents.

Nauseating Expectorants. Antimonials.—Vinum Antim. Tartar Emetic. Antimonii Oxidum. Pulv. Antim., or James's Powder.

Ipecacuanha. Pulv. et Vinum, with *Narcotics, &c.* Pulv. comp., with Opium ; and Pil. comp., with Opium, Squill, and Ammoniacum.

Tinct. Camphoræ cum Opio, with Opium and Benzoin. Smoking of Stramonium and Belladonna leaves. Tobacco.

Stimulant Expectorants.—Sulphur and Alkaline Sulphurets. Senega, Inf. et Tinct.

Balsams.—B. Peruvianum. Styrax. Benzoin ; Tinct. comp.; Balsam of Tolu ; Syr. et Tinct. Benzoic Acid in Paregoric.

Fœtid Gum-Resins.—Assafœtida ; Tinct. et Pil. Ammoniacum. Galbanum.

Copaiba in Emulsion or in pills with Magnesia. Scilla, Pulv. ; Tinct. et Syr. Pil. comp., with Ammoniacum and Ginger. Tinct. Cascarillæ et Inf. Cascarillæ. Allium sativum, &c.

Succinic acid and Oil. Petroleum. Naphtha.

Stimulant Lozenges, as of Capsicum, or *Astringent*, as of Catechu, in cases of relaxation.

Inhaling Stimulant vapours, as of Benzoin and Benzoic′, of Acetic acid, of much diluted Chlorine, Ammonia, &c.

Demulcent Tonics.—Cetraria. Tussilago Farfara. Inula Helenium. Marrubium vulgare. Archangelica, and other Tonics.

DIAPHORETICA. *Diaphoretics.*

Diaphoretics are medicines which increase exhalation from the surface, and the natural function of perspiration. To these, when acting so as to produce sweating, the term of *Sudorifics* is applied. The function of perspiration is useful in keeping down temperature, and in carrying off much Carbon, Hydrogen, and even Oxygen from the blood. Like that of the secretion of urine, it varies in the same individual at different times, because under the influence of different circumstances, as the state of the constitution, the nature of the food, the temperature, dryness, or rarefaction, moisture, or coldness of the atmosphere. The action of a diaphoretic is influenced by many of the same circumstances. Hence it frequently depends entirely upon our keeping the patient in bed that it promotes Diaphoresis ; while if the patient is up, and has the skin exposed to the cool air, it will act as a Diuretic. These two functions are very often antagonistic to each other : therefore when Diaphoretics act freely, much aqueous matter will be carried off by the skin, and the quantity of urine diminished, as well as the secretions of the intestinal canal, by thus causing a determination to the surface. Some act by at once relaxing the surface, others act at first as stimulants, and then produce sweating, when some are probably themselves excreted. The patient requires to be kept *in bed*, and warm diluents should be prescribed ; the *skin* should be *clean* and *warm*, hence the double utility of warm *water* and *vapour* baths, and whatever determines to the surface, as *friction* with brushes, application of *heated bodies*, of *Rubefacients*, of *dry air*, of some *gases*, as *Carbonic gas*, and *Chlorine*. In other cases, *exercise*, or the sympathetic influence of a glass of *cold water*, will produces diaphoresis. From their mode of action and effects, it is evident that they are of extensive application, as those which are relaxing in febrile and inflammatory affections, others in rheumatic and some chronic diseases. According to the nature of the case or the period of the disease, either the relaxing or stimulant Diaphoretics will be eligible in pulmonary affections, in bowel complaints, in cutaneous diseases, or in Dropsy.

Diluent Diaphoretics.—Warm water. Tea. Gruel, &c.

Antimonials.—Antimonii Oxidum. Pulv. Antim. Pulv. Jacobi verus. Antimonii Tersulphuretum. Antimonii et Potassæ Tartras (Tartar Emetic). Vinum.

Ipecacuanha. Emetina. Pulv. et Vinum. Pulv. Ipecac. cum Opio. Pil. Ipecac. comp., with Opium.

Stimulant Diaphoretics.—Sulphur. S. lotum, et S. præcipitatum. Potassii Sulphuretum et Aqua.

Mercurials.—Pil. Hydrarg., &c. Pil. Calomelanos comp. Pil. Calomelanos et Opii. Hydrarg. Sulphuret.

Ammoniæ Liq. Sp. Ammon. arom. Liq. Ammoniæ Acetatis et Citratis Effervescing and Saline Draughts.

Alcoholic and Ethereal Draughts. Sp. Ætheris Nitrosi. Petroleum Naphtha.

Opium (*see* Narcotics). Pil. Ipecac. c. Opio. Pil. Calomel. et Opii. Morphiæ Hydrochloras et Sol. Morphiæ Sulphas. Morphiæ Acetas, et Sol.

Senega. Inf. et Tinct. Guaiacum, Mist., Tinct., et Tinct Ammon.

Serpentaria, Inf. et Tinct. Contrajerva. Mezereon. Inula. Sassafras.

Infusions of Vegetable Excitants, as of Sage, Rosemary, &c.

The milder Diaphoretics and Alteratives are Sarsa, Hemidesmus indicus Calotropis, Dulcamara.

DIURETICA. *Diuretics.*

Diuretics are medicines which are considered to have the power of augmenting the secretion of urine ; and as the purpose of this function is to eliminate from the blood, not only water, but various salts and nitrogenous substances, whether arising from excess of food or from effete tissues, there is no doubt of the importance of any measures which may tend to restore it when suppressed, or augment it when diminished, or requiring for any reason to be increased. As in the case of the function of perspiration, so in that of the secretion of urine, many external circumstances influence its due performance. It has also been stated that these two great functions on many occasions mutually supply the place of, and alternate with each other, and that frequently the causes which favour the one secretion will interfere with the due performance of the other. It follows, therefore, that an opposite course requires to be followed with regard to the treatment of a patient. Hence the skin must be kept cool, and the patient kept out of bed. Therefore the day-time is frequently the best time for the exhibition of Diuretics. Their action is assisted by coldness and dampness of the atmosphere, and also by the moderate, not excessive, use of diluents; and is impeded, as the secretion of urine itself is, by too free an action of the intestines or of the function of perspiration, as well as by whatever increases plethora and pressure on the circulation, or promotes congestion in the liver or in the kidney itself. As the action of some Diuretics is incompatible with that of others, it is absolutely necessary to pay attention to the peculiar mode of action of each. This has been well done by Dr Paris, whose arrangement we have adopted, but have reversed its order, for the purpose of better comparing the list with that of Diaphoretics, as well as of other Therapeutic agents.

The action of Diuretics is greatly assisted by the aid of Diluents; so under the heads of Acids, Alkalies, and Antilithics it has been stated how much they change the state of and are themselves excreted with the urine; but for this very reason they may be unsuitable when the object is merely to increase the quantity, without altering the chemical nature of the urine. But for many cases the saline diuretics are very eligible; it is necessary to remember that not only the alkalies, but the salts of the vegetable acids, will render the urine alkaline, and assist in the elimination and removal from the body of effete animal structure. The Nitrate of Potash is not only one of our most certain saline diuretics, but Dr G. Bird has called attention to its depuratory effects, and he recommends it in doses of ℥ß or ℥j., dissolved in two or three pints of any diluent, in the twenty-four hours. An enormous quantity of urine replaces the scanty excretion generally noticed in rheumatism, and the cure of the patient is considerably expedited. In other cases, whatever acts upon the system so as to promote absorption, will seem to have a diuretic action, as, for instance, Tonic and Stimulant medicines in cases of debility. So again, when diminution of the urine is owing to general pressure on the circulation in inflammatory, and to a stoppage of secretions in febrile states of the system, then venesection, warm baths, and antimonials, by producing relaxation and a more natural state of other organs, will at the same time restore the secretion of urine to a healthy state. In like manner, Digitalis, Lobelia, Lactucarium, by diminishing arterial action, may favour absorption. While Mercurials, by improving biliary secretion and relieving the portal circulation, will thus facilitate the secretion of urine. Of the Stimulant Diuretics, some owe their properties to the presence of Volatile Oil; that of Juniper was found by Dr Alexander to act powerfully when a few drops were added to Tea. Others secrete particular principles, while some even of the diffusible stimulants are found useful in other cases. Hence Diuretics may be beneficially employed in very different states of the system, and be useful at one time in freeing it of any excess of fluids, and at another serve to carry off some of the solid constituents of the body; and some may do good by their contra-stimulant effects.

1. *Medicines which act primarily on the Stomach or System, and secondarily on the Urinary Organs.*
   - *a.* By diminishing arterial action, and increasing that of absorption.
     Venesection and some parts of the Antiphlogistic treatment may be considered to act in this way, as well as Digitalis, Pulv. Inf. Tinct. et Extr., Pil. Dig. et Scillæ. Linim. with Ammonia, the Inf. or the Tinct. with Soap Liniment. Digitalinum. Colchicum. Tabacum, Vinum. Lactucarium and other Narcotics.
   - *b.* By increasing the tone of the Body in general, and that of the Absorbent System in particular.
     Bitter Tonics, q. v.—the effects of some others, as of Chimaphila, may be ascribed partly to their Tonic effect.
   - *c.* By producing Catharsis, and thereby increasing the action of the Exhalants directly, and that of the Absorbents indirectly.
     Elaterium. Gambogia. Jalap. Pulv. Jalapæ comp. See Cathartics.
2. *Medicines which act primarily on the Absorbents, and secondarily on the Kidneys.*
   Mercurials. Hydrarg. Subchlor. et Chloridum. Iodum. Potassii Iodid. Mercurials with Squill, &c.
3. *Medicines which act primarily on the Urinary Organs.*
   Potassæ Liquor. Potassæ Carb. et Liq. Bicarb. Potassæ Aqua efferves.
   Potassæ Nitras et Potassæ Chloras.

Potassæ Acetas et Citras. Potassæ Bitartras, also Potassæ Tartras Acida in Pulv. Jalapæ comp.

Sodæ Acetas et Citras. Sodæ Potassio-Tartras.

Nitre in gr. x. doses sometimes prevents Incontinence of Urine, as does Tinct. Ferri Perchloridi.

Sodæ Carb. et Bicarb. Sodæ Biboras. Sodæ Phosphas. Sapo durus.

Magnesiæ Sulphas. Diluted Mineral acids. Some Mineral waters.

Stimulant Diuretics.—Ammoniæ Liq. et Carb. Spiritus Ætheris Nitrosi. Rhine Wines, especially with Squill and Bitter Tonics.

Armoracia. Comp. Spirit, which contains Orange-peel and Nutmegs. Cochlearia.

Scoparius, Succus et Dec. Carotæ Fructus. Parsley and other Umbellifers. Asparagus.

Juniperi Baccæ et Cacumina. Ol., et Spir. Terebinthina et Oleum.

Scilla. Pulv. Tinct. Syrupus. Allii species. Colchicum. Veratrum.

Senega, Inf. et Tinct. Tinct. Buchu, Inf. et Tinct. Chimaphila (Pyrola). Uva Ursi, Inf.

Arctium minus (Lappa). Pareira Dec. et Extr. Liquid. Sarsa. Dulcamara. Inf. Ulmi Cortex.

Cantharides, Tinctura.

Copaiba et Oleum; Cubeba; Ol. Cubebæ; stimulants of the Urethra.

CATHARTICA. *Cathartics. Purgatives.*

Cathartics (from καθαίρω, I purge) are medicines which increase the peristaltic movements of the intestinal canal, evacuate its contents, usually augment its mucous secretions, and often promote the separation of the excreted products, which Liebig has inferred that it is one province of the bowels to separate from the blood. They were formerly distinguished into *Hydragogues*, when causing watery evacuations, *Cholagogues*, as favouring the secretion of bile, &c. Many other terms have ceased to be employed; but these continue to be still used. Cathartics are also often distinguished according to their energy of action, as Laxatives, which merely evacuate the intestinal contents, and Purgatives, which stimulate secretion and accelerate evacuation. But among the latter the more violent are distinguished by the name of Drastics and of Hydragogue Cathartics, while others may be ranged under the head of CHOLAGOGUES, with a few other medicinal agents, which are not, however, cathartic.

Cathartics differ also according to their mode of action, and also with reference to the part of the intestinal canal to which their action is more particularly directed. Thus some things probably act only as mechanical irritants on the intestinal surface, and a subsequent effect is produced by nervous reflex action; for instance, brown bread, which, though called digestive, acts as an aperient from the bran of the wheat not being digested, as is the case also with the elephant bread of India, some small seeds, &c. Most of the true cathartics are, however, first absorbed into the system; many produce their effects when introduced by some other medium than the intestinal canal; some have been proved to be excreted with the excrementitious matter, and all, therefore, are supposed thus to cause purging. Saline purgatives, often called cooling medicines, act mildly on the whole intestinal canal, producing copious watery evacuations. Castor Oil stimulates superficially, but gently, the mucous surface of the small intestines in moderate doses, but may be made to act violently when these are increased. Senna also acts on the small intestines, but with more activity, often causing nausea and griping. Jalap, Scammony (and their resins), and Colocynth, are more or less acrid, and act with energy upon the whole extent of the intestinal canal. Rhubarb evacuates, but exerts a subsequent tonic effect. Aloes, slow in its effect, stimulates the colon and rectum. Podophyllum does the same, and is thought to have a special action on the liver.

Hellebore, Croton Oil, and Elaterium, act with great violence, as well as rapidity, and, causing copious watery motions, are specially called Hydragogue Cathartics. The preparations of Mercury, which increase all the secretions, are particularly valuable from stimulating the intestinal glands and the secretion of bile from the liver. The influence of Cathartics as therapeutical agents is most extensive, first, from the great extent of surface upon which they act, covered as this surface is, with secreting organs; secondly, from the certainty, as well as from the rapidity with which most of them act. A part of their influence, at least some of them, as of Aloes, is from proximity propagated to the uterus. Many of them, especially the Saline Cathartics, act also as Diuretics, but here quantity seems to influence the mode of action, large doses acting as purgatives, small ones as diuretics, especially when much diluted. But during the action of brisk Cathartics, the quantity of urine is generally diminished, and the salts of the vegetable acids are not so readily converted, if at all, into carbonates. As the copious watery evacuations must diminish the quantity of fluid in the body, they necessarily diminish excitement, at the same time that they favour absorption, and therefore they may, for the first reason, be employed as powerful agents in antiphlogistic treatment, and, for the second, in cases of dropsy. As they are various in nature, so there is ample field for selection. For cases of irritation in the intestinal canal, the mild-acting oils or neutral salts may be employed, or in cases of acidity with diarrhœa, the antacid Magnesia or its carbonate, with the subsequently astringent Rhubarb. So in cases of fever or inflammation, though we may choose the fully effective, we have to avoid the irritant; while in other cases, when we would rouse the system, or make the action on the bowels to act as a derivative from other parts, we equally select such as are effective, but prefer Calomel and the resinous purgatives, because they are slower and more continuous in their action. Hence, from the necessity of relieving the system, or facilitating the performance of other functions, or from the necessity of getting rid of effete matters, there are few complaints in which purgatives are not useful, if not essential.

Laxatives from the Mineral Kingdom.—Sulphur sublimatum et præcip. Magnesia. Magn. Carb.

Saline Purgatives.—Magnesiæ Sulphas. Potassæ Sulph. Bisulph.; this may be given in effervescence with Carb. Soda.

Potassæ Tartras, et Bitartras. The latter in Pulv. Jalapæ comp. Acetas Potassæ, seldom used as a purgative.

Potassæ Sulphas cum Sulphure.

Sodæ Sulphas. Sodæ Phosphas, Sodæ et Potassæ Tartras. Sodæ Acetas. Sodii Chloridum.

Mercurial Purgatives.—Pil. Hydrarg. Hydrarg. c. Creta. Hyd. c. Magnesia. Hydr. Suboxidum. The last uncertain in its action.

Hydrargyri Subchloridum (Calomel).

Laxatives from the Vegetable Kingdom.—Manna in Conf. and Syr. Sennæ. Cassiæ Pulpa et Conf., with Manna and Tamarinds in Conf. Sennæ. Tamarindus, in Conf. Sennæ. Prunum. Uvæ Passæ. Fici.

Viola odorata. Rosa centifolia et Syr.

Fixed Oils. Amygdalæ Ol. Olivæ Ol. Lini Oleum.

Purgatives.—Ricini Oleum. Sennæ, Syr., Inf. with Ginger, Conf., with Pulp of Cassia and Tamarinds, Prunes, Figs, and Coriander. Tinct. comp., with Raisins, Caraway, and Coriander.

Rheum. Pil. Extr. Inf. Pulv. comp., with Magnesia and Ginger. Pil. comp., with Aloes, Myrrh, and Peppermint. Tinct., with Coriander, Saffron, and Cardamoms.

Colocynthis; Extr. et Extr. comp. Pil. Comp., with Scammony, Aloes, Sulphate of Potash, and Oil of Cloves. Pil. Coloc. et Hyoscyami. Enema.

Elaterium or Extr. of Elaterium. Tiglii *vel* Crotonis Oleum.

Jalapa. Tinct. Extr. et Resina Jalapæ. Pulv. comp., with Cream of Tartar and Ginger.

Scammonium. Resina. Mistura, with Milk. Conf., with Caraway, Cloves, and Ginger. Pulv. comp., with Jalap, and Ginger.

Cambogia. Pil. comp., with Aloes and Ginger.

Aloes. Extr.; Tinct. with Liquorice. Pil. Aloes c. Myrrha, et Pil. Aloes et Assafœtidæ. Dec. Aloes comp., with Myrrh, Saffron, Carb. Potash, and Tinct. of Cardamoms. Vinum Aloes, with Cardamoms, Ginger. Enema Aloes.

Podophyllum. Podophyllii Resina.

Helleborus niger. Veratrum album. Colchicum.

Rhamnus et Syr. Linum catharticum, little used. Euphorbium.

Terebinthinæ Oleum.

Enema Aloes. E. Magnes. Sulph. E. Terebinthinæ.

Cholagogues.—Medicines considered to promote the secretion of bile. Nitro-muriatic acid. Mercurial preparations. Aloes. Rhubarb. Taraxacum.

ANTHELMINTICS. *Vermifuges.*

The word Anthelmintic is sometimes employed to indicate not only the medicines prescribed to prevent the production of worms, but also those which destroy or expel them, but the term Vermifuge is applied to the latter only. As in other classes, we find very different medicines may be employed to produce the same effects, because worms may exist in different states of the constitution; therefore, whatever rectifies this, makes the intestinal canal less suitable to the residence of these parasites. As some of the medicines employed to irritate and dislodge worms from the intestinal canal act entirely as mechanical agents, that is, by irritating the worms, as they press their bodies against the sides of the intestinal canal, they might appropriately be treated of with the other groups of that division; but as the remedies so acting are few in number—for instance, Tin and Iron filings coarsely powdered, Cowhage, and Kamala—while the remainder are either special in their mode of action, or owe their power to their action as Purgatives, it is preferable to treat of them after this class of remedies. Purgatives are frequently required to clear the intestinal canal. Tonics are necessary to give to the intestinal canal a healthy tone, but some are specially injurious to the worms.

The worms commonly occurring in the intestinal canal in this country are the

Tænia solium, or common Tape-worm;

(Bothriocephalus latus, or Broad Tape-worm, occurs in Switzerland, &c.);

Trichocephalus dispar, or Trichurus, Long Thread-worm;

Oxyuris vermicularis, Maw-worm, or Ascarides, and

Ascaris lumbricoides, common or long Round-worm.

Mechanical Anthelmintics.—Stanni Pulvis. Ferri Limatura.

Mucuna pruriens. Kamala, the strigose pubescence of Rottlera tinctoria. Gigartina Helminthochorton, from fine spiculæ of Corals, &c., intermixed with it.

Specific Anthelmintics.—Granatum. Radicis Cortex. Dec. Filix Mas, Pulv and Ethereal Extract. Cusso, or Brayera anthelmintica.

Andirainermis. Spigelia Marylandica. S. Anthelmia. Persicæ Folia.

Terebinthinæ Oleum. Rutæ Ol. Tanacetum. Absinthium. Santonica. Santoninum.

Purgatives, &c. as Anthelmintics.—Calomel. Gamboge. Jalap. Scammony.

Bitters generally are injurious to worms, and useful also in giving tone.

Enemata against Ascarides. Sol. of Salts in Inf. Quassiæ. (*Paris.*) Enema Aloes.

Injections of cold water, of Bitter Infusions, or of Camphor in Oil.

EMMENAGOGA. *Emmenagogues.*

Medicines which are considered to have the power of promoting the menstrual discharge when either retained or suspended. As this is sometimes the primary cause, and at other times the consequence of some other disease, the treatment necessarily differs; especially as Amenorrhœa is as often dependent on a want of constitutional energy in a leucophlegmatic habit as on a plethoric state of the constitution, with irritation of the uterine system, brought on perhaps by an application of cold, &c. In either case attempts must first be made to restore the constitution to a natural state, and then to prescribe those remedies, all more or less stimulant, which are considered to have a specific effect as Emmenagogues, though it is doubtful whether there are any such, most seeming to act by contiguous sympathy. Dr Paris has observed, "that as the uterus is not an organ intended for the elimination of foreign matter, it is necessarily less under the control of medicines."

In cases of plethora, Venesection may be necessary, or Cupping on the Loins, with Leeches to the Loins or Groins, and Legs or Feet. Purgatives. Hip-baths. Hot Pediluvia of Water, or made more stimulating with Mustard-flour. Exercise, especially on horseback, in a salubrious air.

In cases of depression, Warm Purgatives are equally necessary, accompanied with the alterative action of Blue Pill; at first mild, then stronger Tonics, followed by the preparations of Iron. Frictions on the Lumbar region. Electricity. Nourishing Diet. Exercise. Fresh air. Sea-bathing. Shower-baths. Alteratives often necessary, or Mercurials, as Pil. Hydrargyri, &c., and Pil. Calomelanos comp. (*Plummer's Pill.*) Iodine, in form of Iodide of Potassium, or the Syrup of the Iodide of Iron.

Purgatives employed as Emmenagogues.—Aloes. Pil. Aloes c. Myrrha, and the Dec. Aloes and Tinct. Aloes: with Assafœtida in Pil. Aloes et Assafœtidæ, with Iron, in Pil. Aloes et Ferri.

Colocynthis. Senna. Cambogia. Helleborus.

Fœtid Antispasmodics—as Assafœtida. Moschus. Castoreum.

Galbanum in Pil. Galbani comp., with Assafœtida, Sagapenum, and Myrrh; also in Pil. Assafœtidæ comp.

Myrrha; Tinct. Myrrh with Iron, in Pil. Ferri et Mistura Ferri, also in Pil. Assafœtidæ Co., and with Aloes. (*See* supra.)

Mineral Tonics.—Ferri Sulphas. Pil. et Mist. Ferri comp. Ferri Carbonas Saccharata, et Pil. Ferri Iodidum et Syrupus.

Emmenagogues.—Rubia Tinctorum and Meum Athamanticum, now little used.

Senega, Inf. et Tinct. Serpentaria, Inf. et Tinct. Rutæ Ol. et Confectio Tanacetum.

Juniperus. Sabina et Oleum. Ergota, a stimulant of the motor nerves of the uterus, has been found useful by Sir C. Locock, who states the same of a combination of Myrrh, Aloes, Sulphate of Iron, and the Essential Oil of Savine

RUBEFACIENTIA. *Irritants. Vesicants.*

Rubefacients, as their name indicates, produce redness of the skin, with warmth and increased sensibility, &c. If long applied, or more concentrated, vesication will ensue; and on continuance of the application, a suppurative discharge; whence Epispastic, from *ἐπισπάω, I draw.* Tartar Emetic produces a small pustular eruption. These local effects sometimes react upon the constitution, so as to induce a state of general excitement, as in the case of Stimulants. The local external effect produced by the Rubefacient or Epispastic very frequently has the effect of relieving some internal irritation or deep-seated, even distant, pain; and therefore it is for their Counter-irritant or Revulsive effects that these remedies are applied; sometimes only to relieve slight internal inflammation, as

Hartshorn and Oil on the neck to relieve sore throat, or a blister behind the ear to relieve toothache. Some, instead of merely exciting, act as irritants. But it is usually in chronic affections of the chest or of the abdominal cavity that they are most employed, or in spasmodic attacks of the limbs. Sometimes the head is relieved by hot pediluvia, or by Sinapisms to the feet. Issues, Setons, Acupuncture, are employed on the same general principles. Some act as local Stimulants, and produce healthy granulations. Occasionally stimulant frictions and Sinapisms are applied in diseases accompanied by debility, to rouse the system in great depression of the vital powers.

Dr Granville observes of this class of remedies, that many disorders which are considered difficult of cure, " may be speedily and successfully cured without having recourse to internal remedies.

" Even when diseases are of a nature to require the use of internal remedies, strong ammoniated and spirituous preparations, holding Camphor and Volatile Oils in solution, externally used, will be found to be most powerful auxiliaries in hastening and securing the good effect of those remedies.

" That the principle on which all such external agents are supposed to act in the cure or alleviation of human maladies has been termed *Counter-Irritation;* but that, in adopting such terms, many of the phenomena which accompany the use of ammoniated external applications are left unexplained."

Friction. Heat; in form of Hot water. Steam. Heated Sand and Metals, Hip and Foot baths.

Gases; as hot dry Air, Chlorine, Carbonic acid, and Sulphurous′ gases.

Acid Solutions, as of Nitric′, Acetic′, &c. Acetic acid is used as an epispastic.

Alkaline Solutions, as of Ammonia, Potash, and their Carbonates. Liquor Ammoniæ fortior. Linim. Ammoniæ.

Antimonii Potassio-Tartras; Sol. and Ung. Argenti Nitras, or in solution.

Local Stimulants.—Ammoniæ Hydrochloras. Potassii Sulphuretum et Aqua. Sodii Chloridum. Borax. Mel Boracis.

Ung. Hydrarg. Nitratis, et Calomel anos. Hydrargyri Oxidum et Ung. Hydrargyri Ammonio-Chloridum et Ung.

Vegetable Irritants employed as Rubefacients, Local Stimulants, and Epispastics.

Ranunculus acris. R. Flammula. Staphisagria. Delphinia. Cocculus indicus. Ung. Cocculi. Armoracia. Sinapis alba et nigra. Cataplasma Sinapis. Volatile Oil of Mustard. Pyrethrum. Capsicum., Tinct. Mezereon. Euphorbium. Sabina et Ung. Veratrum, Veratria et Ung. Piper nigrum. Allium. Zingiber.

Volatile Oils (*See* STIMULANTS) may be used as Rubefacients; also others less agreeable, as Oleum Rutæ, &c.

Turpentines, as Terebinthina Chia, T. vulgaris, Veneta, et Canadensis. Oleum et Linimentum.

Creasote, pure or diluted. Ung. Creasoti. Crotonis Oleum. Toxicodendron.

Acidum Carbolicum. Glycerinum.

Resins, as Resina. Thus, Abietis Resina, et Pix Burgundica. Emp. Picis. Elemi, et Ung. Galbanum, et Emp. Pix liquida. Pix nigra et Ung. Cerevisiæ Fermentum, and Cataplasm.

Cantharides. Tinct. Acetum, Linimentum (epispast). Ung. Emp. Emplastrum Calefaciens. Charta Epispastica.

2. *General Stimulants.*

General Stimulants have been distinguished from Local Stimulants, in not having their influence confined to one or two organs, but as exciting all the principal functions of life, as the sanguineous, muscular, and secreting systems, by directly influencing the nervous system; hence, by some, they are included under the head of Neurotica. Some are, however, more special, that is, affecting one set of nerves or particular functions of the mind or the senses more than others. The majority are temporary in their effects, and therefore require a repetition of the dose to keep up the impression. Tonics have been distinguished as more permanent in their effects, and as affecting the sanguineous and muscular, more than the nervous system.

TONICA. *Tonics.*

Tonics are medicines possessing the power of gradually increasing the tone of the muscular fibre when relaxed, and the vigour of the body when weakened by disease. Though resembling Astringents in some of their effects, they do not produce corrugation, unless when combined with Astringent principle, as is the case with some true Tonics. Acting like Excitants on the vital principle through the medium of the nervous system, they differ from them in the slowness with which they operate, as well as in the permanence of their effects, and in their use not being followed by exhaustion or perceptible collapse. They are hence defined by Dr Murray as "stimulants of considerable power, permanent in their operation." If carried to excess, or too long continued, they may act as Irritants or be productive of debility; for "if given when the powers of the system are at their maximum, Tonics will assume the characters of excitants, and their administration be followed by collapse." (*Paris.*) When a Tonic is fitly prescribed, as in a case of debility, its effects are gradually perceived; the energy of the stomach and the appetite are increased, digestion is facilitated, the force of the circulation augmented without corresponding quickness, and the respiration becomes fuller and more vigorous. In consequence of the more healthful performance of these functions, nutrition becomes necessarily more perfect. Absorption is performed with more vigour, as is first evident in the constipation which usually follows the successful exhibition of Tonics, but is soon perceptible in other parts, so that the œdematous swellings of invalids disappear. Secretions become more natural, the urine more scanty and high-coloured; inordinate and partial sweats disappear, the skin returns to its normal state of softness, and the countenance resumes the natural glow of health. The senses and all the faculties become more active, and the strength increased. Thus the patient, labouring under diseases of real, not apparent debility, or recovering from acute disease, or the effects of depressing and evacuating remedies, is restored to pristine health and energy.

Some of the Tonics, as Cinchona and its alkali Quinine, with the Arsenious acid, especially in the form of the Arsenical Solution, are prescribed as Antiperiodics; that is, as remedies to be taken in the intervals of paroxysmal diseases, so that Ague and Remittent Fever, or attacks of Neuralgia and even of Rheumatism, which observe some periodicity in their accession, are very frequently controlled by small doses of such medicines regularly repeated in the intervals, or by a larger one given immediately before a paroxysmal attack. The most violent Remittent will often be affected by a few drops of Arsenical solution, if prescribed immediately after the acute symptoms have been controlled by other means, and when anything like a remission is observed in the febrile attack.

Tonics are prescribed either in substance or in Infusion or Decoction, with the addition frequently of a Tincture of the same or some other Tonic, or of one of the aromatic Stimulants. They require to be prescribed in moderate doses frequently repeated, as every two or three hours, sometimes changing the tonic. It is usually preferable to begin with the milder before proceeding to the more powerful metallic tonics, as the preparations of Iron. In some diseases, as Chlorosis and Anæmia, characterised by paleness, &c., this metal is particularly useful, as being an essential constituent of the red colouring matter, which in these diseases is deficient. It is also a constituent of some other tissues and fluids, and therefore in combining with them acts in a great measure chemically.

Nutritious Diet. Cold. Exercise in the open air. Cold and Sea-bathing.

Demulcent Tonics.—Cetraria et Dec. Ulmus et Dec. Pareira, Inf. et Extr. Calumba, Ext. Inf. et Tinct., a mild tonic; thought also to be a little sedative; and being, like Quassia, without Tannin, may be prescribed with the salts of Iron.

Bitter Tonics.—Calumba. Quassia, Inf. et Ext. Simaruba. Gentiana, Ext. Inf. et Tinct. comp. Chiretta, Inf. Tinct. Centaurium. Menyanthes. Centaurea benedicta.

Nux Vomica, Extr.; a powerful Bitter and Stomachic.

Stimulant Tonics.—Drimys Winteri. Canella alba. Aurantii Cortex, Tinct. Syr. et Inf. Limonum Cortex. Cusparia, Inf. et Tinct.

Ruta. Absinthium. Tanacetum. Archangelica. Marrubium. Cascarilla, Inf. et Tinct. Lupulus, Inf. Tinct. et Ext. Acorus Calamus.

Antiperiodic and Astringent Tonics.—Cinchona pallida, flava et rubra; Inf. Dec. et Tinct.; Tinct. comp., with Orange-peel, Saffron, and Serpentaria. Quinia and Quiniæ Sulphas. Tinct. comp., Quinidine. Amorphous Quinine. Cinchonine and its Sulphate. Bebeerine. Salicis Cortex, Dec. Salicine. Narcotine. Piper nigrum? Uva Ursi. Chimaphila. Beberiæ Sulph.

Mineral Antiperiodics.—Acid. Arseniosum. Liq. Potassæ Arsenitis. Sodæ Arsenias.

Mineral Tonics.—Dil. Sul′. Dil. Nit′. Dil. Mur′.

Ferrum. Ferrum Redactum. Emp. Ferri et Emp. Thuris. Ferri Peroxidum. Ferri Oxidum Magneticum. Chalybeate Mineral Waters.

Tinct. Ferri Perchloridi. Ferri Sulphas. Fer. Carbonas Saccharata. Pil. Fer. comp., with Carb. of Iron, Myrrh, and Sulph. Soda. Mistura Ferri, with Myrrh, Nutmeg, and Sulph. Potash. Ferri Arsenias. Ferri Phosphas, et Syrupus. Ferri et Quiniæ Citras. Ferri Valerianas.

Ferri et Potassæ Tartras. Vinum Ferri. Ferri Citr., et Ammonio-Citras. *Aqua Chalybeata. Ferri Acetas. Lactate and Malate.*

With Iodine, &c.—Ferri Iodidum et Syr. With Aromatics, Ferri Mist. Arom. Pil. Rhei et Ferri; Pil. Aloes et Ferri.

Zinci Oxid. et Sulph. Cupri Sulphas et Ammonio-Sulph. Bismuthi Nitras.

STIMULANTIA. *Excitants. Exhilarants.*

Stimulants, or Excitants, as they are also called, are distinguished as medicines which exalt nervous power. Those which are usually included under this term, accelerate, by directly influencing the nervous centres, all the other principal functions of life—that is, the sanguineous, muscular, and secreting systems. Having been absorbed into the circulation, they are brought into contact with nervous matter, and some, no doubt, afterwards eliminated. Some, more than others, excite the functions of the brain, quicken sensibility, exhilarate the spirits, and clear the mental faculties. Of these, some, which are also the most powerful, are sometimes placed among narcotics; because, when taken in sufficient quantities, inordinate excitement ensues, which is followed by collapse and a comatose state, closely resembling the effects of true narcotics. But as they are not employed for such purposes in medicine, it is preferable to attach them to this group, only distinguishing them by the title of Diffusible Stimulants. Other Stimulants, though exciting nervous action, do so in a limited way—that is, affect only particular nerves, and are, therefore, separated from the others as Special Excitants or Stimulants. Again, whatever removes an impediment to the due performance of the natural functions will sometimes appear to have a Stimulant effect.

Stimulants, in addition to ammonia, consist of volatile oils, resins or acrid principles, and drugs which contain them. As stated under the head of Rubefacients, when applied externally, they produce redness, a sensation of warmth quickly communicated to surrounding parts, often followed by pain, according to the more or less susceptibility of the organ. If taken internally, the sensation of warmth is experienced in the stomach and intestinal canal, followed by a marked increase in the vital energy and contractility, with activity of digestion, often accompanied by thirst and dryness of the mouth. In large doses, those which are more acrid will prove irritant. These effects are very temporary with many Stimulants; with others, they are quickly communicated to the heart and circulation, affecting the pulse in force and frequency; more animal heat is developed, and transpiration promoted both from the cutaneous and pulmonary surfaces, as well as many of the secretions augmented. With some of the Stimulants the organs of generation participate in the general excitement. In all these cases it is the nervous or true cerebro-spinal system which is primarily affected, and through it, by reflex action, all the cerebro-spinous organs. Dr Pereira conceived that the action of most was confined to the sympathetic system of nerves; hence he included them among his Ganglionics. "But the nervous energy becomes more equable and rapid; the muscular contractility more energetic; the senses more delicate and perfect, and the intellectual faculties even seem to acquire more activity and development." (*Guersent.*) Action, however, is not always power, and all excitement is followed by exhaustion; and though the collapse is proportionally much greater, and also different, with Narcotics, it may be produced to as great an extent by the use of a large quantity of a Diffusible Stimulant; but in such a case it ceases to be employed as a Stimulant only.

Stimulants are useful in cases of debility, where this is real, and unaccompanied by inflammation, and not merely apparent, whether the debility be the consequence of profuse Hæmorrhage or of other inordinate discharges, or a consequence of Asphyxia, or of Syncope ; in great general debility, or in Anæmia and Cachexia without any local inflammation, or in the last stages of many grave diseases, when the powers flag and life appears about to be extinguished. They remedy the want of nervous force ; and, where this is temporary, serve to restore vital power, and give time for the restoration of other functions. Their use, however, requires the greatest caution and discrimination. Though they may be prescribed beneficially in languor, relaxation, and debility, and in some cases even of chronic Inflammation—as is done with stimulant lotions to the eye in a state both of incipient and of chronic Ophthalmia—their employment is usually limited to prescribing them in conjunction with other classes of remedies.

Heat. Electricity. The Vital Stimuli, as Heat, Air, Food, Drink, will all act as Stimulants in cases of Debility, or where the patient has been deprived of their use. When used in moderation, these are not followed by exhaustion.

Ammoniæ Liq. Sp. Ammoniæ arom. Ammoniæ Carb. Phosphorus. Oxygen.

Aromata or Spices, grateful in odour and taste, are hence used as Condiments. They stimulate the stomach; are useful as Carminatives, and as Adjuncts to remedies of different kinds, as Tonics, Antispasmodics, and Cathartics.

Of *Myrtaceæ.*—Caryophyllum, Oleum. Pimenta, Ol. Spir. et Aqua Cayaputi Ol. Of *Laurineæ.*—Cinnamomum. Ol. Spir. Tinct. Aq. et Tinct. comp., Pulv. Arom. with other aromatics. Cassia. Laurus nobilis. Sassafras. Of *Myristiceæ.*—Myristica, Ol. et Spir. Of *Piperaceæ.*—Piper nigrum. Conf. P. longum. Of *Scitamineæ.*—Curcuma. Cardamomum, Tinct. comp. Zingiber, Tinct. et Syr. Of *Irideæ.*—Crocus.—Canella alba.

Capsicum, Tinct. Sinapis nigra et alba.

Others valuable chiefly on account of their *Volatile Oil*, as Ol. Calami Aromat. (Spikenard). Of *Aurantiaceæ.*—Limonis Ol. et Aurantii Ol. Of *Umbelliferæ.*—Anisum, Carui, Fœniculum, Anethum, Cuminum, Coriandrum. Of *Labiatæ.* Melissa, Mentha viridis, Piperita, and Pulegium, Lavandula, Rosmarinus, Origanum vulgare, et Majorana.

Others less agreeable, as Ol. Rutæ. Ol. Anthemidis et Tanaceti. Oleum Juniperi, et Sabinæ.

Turpentines—as Terebinthina Chia, vulgaris, &c. Oleum Terebinthinæ.

Resins—as Elemi. Mastiche. Olibanum. Myrrha. Balsam of Peru, &c.

Petroleum. Naphtha. Creasotum et Mist.

See also Stimulant Tonics, Diaphoretics, Expectorants, *and* Diuretics.

Diffusible Stimulants.—These, which include Alcohol and Ether, are usually distinguished from other Stimulants by the rapidity with which they excite the whole system through the medium of the brain and nerves. These effects, in moderate doses, are exhilarant, and soon pass off; in larger they produce intoxication, which is followed by exhaustion and collapse, and the comatose state characteristic of drunkenness. Though Opium and the several preparations of Hemp are used in all Eastern countries as Excitants, they are so soon followed by symptoms of collapse, that it will be preferable to arrange them, as well as others, under one of the sections of Narcotics. Ether, though at first excitant, is afterwards so soothing as to be prescribed in nervous affections, and frequently with opiates. When inhaled it produces insensibility to pain, like Chloroform.

Spiritus Vini Gallici (Brandy). Spir. rectificatus et tenuior. Vinum Xericum and other wines.

Æther. *Æ. Sulph.* Spir. Æther. Nitrosi. Chloroform, et spiritus. Spiritus Pyroxylicus (nauseous).

SPECIAL EXCITANTS are distinguished by being local in their action, and exciting only particular nerves, as Strychnia does those of the spinal cord, especially the motor branches, thus causing a contraction of muscles.

Special Excitants.—Nux Vomica. Tinct. et Extr. Strychnia. Brucia. Toxicodendron. Arnica montana. Ergot of Rye.

3. *Depressants or Contra-Stimulants.*

Dr Royle has grouped together the Narcotics, Antispasmodics, Refrigerants, and Sedatives, not that they can be considered as resembling each other physiologically in action (though the Sedatives are often united with Narcotics), but because all are employed to subdue inordinate action, the Refrigerants and Sedatives when occurring in the circulation, Narcotics to assuage pain, control restlessness, and to procure sleep, while Antispasmodics have a quieting effect on the disordered nervous system.

NARCOTICA. *Hypnotica. Anodyna.*

Narcotics are so named from νάρκη, the torpedo, which stupefies any other animal which it touches, because stupefaction is the most striking symptom of some, though not of all the medicines which are usually included under the head of narcotics. The name, therefore, being objectionable, Dr Pereira suggested that of Cerebro-Spinals, as including all those which affect either the brain or spinal marrow, and their respective nerves. But the great peculiarity of this group of medicines is, that hardly two of them resemble each other exactly in their mode of action, and, therefore, no one name will apply equally well to all; it is better to divide them into smaller groups, to which distinctive appellations may be given. Stimulants produce excitement, and the Diffusible Stimulants considerable excitement, followed by corresponding depression. Opium, the type of Narcotics, slightly accelerates the pulse, stimulates some of the functions, exhilarates the spirits, but its use is soon followed by drowsiness and sleep. Narcotics are distinguished from true Sedatives by producing, when prescribed in moderate doses, "an increase of the actions of the nervous and vascular systems, but which is followed by a greater depression of the vital powers than is commensurate with the degree of previous excitement, and which is generally followed by sleep" (*Paris*). They entirely overcome volition and sensation, as well as the special senses. From the varied effects which the remedies usually classed under this head produce, some, as Opium, are called Soporifics and Hypnotics, from causing sleep; others, of which again Opium is the most conspicuous, are called

Anodynes, from allaying pain; but of these, some, as Belladonna and Stramonium, induce sleep only from relieving pain, and are remarkable for dilating the pupil, and producing a kind of mirthful delirium and wandering of the mind. Aconite, and its alkali Aconitia, produce numbness in the sentient nerves, over which they are applied, and act as general sedatives, with which they should be arranged, as well as a fourth group, which includes Hemlock and its alkali Conia, as these produce paralysis of the muscles, from acting on the motor nerves. Hemp and its various preparations, at first exciting, are followed by sleep, stupefaction, relaxation of the muscles, and also, occasionally, by a state resembling catalepsy; while another group, now commonly called Anæsthetics, are conspicuous for diminishing or entirely removing the sensibility to pain. The drugs called Acro-narcotics have the power of allaying pain, besides acting as irritants in the intestinal canal; they also produce nausea and great depression, and might therefore form a group of Sedatives. Opium, however, is itself capable of effecting most of the objects required. Though excitant in the first instance, its use is soon followed by diminished sensibility and sleep. Violent pains are relieved, powerful spasms subdued, and inordinate secretions, with the exception of that of the skin, restrained.

Narcotics are had recourse to chiefly to assuage pain and to procure sleep; hence they may be useful in a great variety of affections, but chiefly in the treatment of nervous and spasmodic complaints, painful diseases, as Neuralgia, Rheumatism, &c., and in the last stages of other painful disorders.

Papaver somniferum. Capsulæ. Dec. et Syrupus.

Opium. Ext. Liquidum. Pil. Opii. Conf. vel Elect. Tinct. (Laudanum). Vinum. Acetum. Liq. Opii sedativus, and Black Drop. Enema, Lin. et Emp.

Pills with Opium.—Pil. Saponis comp. et Pil. Styracis comp. *Pil. Calomelanos et Opii.* Pil. Plumbi cum Opio.

Tinct. Camphoræ comp., with Opium, Camphor, and Benzoic′.

Opium with Ipecacuanha.—Pulv. Ipecacuanhæ cum Opio.

Opium with Astringents.—Pulv. Kino cum Opio. Pulv. Cretæ Arom. c. Opio. Ung. Gallæ cum Opio.

Morphiæ Hydrochloras, Liquor. Trochisci Morphiæ. Troch. Morphiæ et Ipecac. Suppositoria.

Morphiæ Sulphas. Morphiæ Acetas. Citrate and Bimeconate.

Lactuca sativa, et virosa. Lactucarium.

Humulus Lupulus. The Tincture, and Tincture of Hop-Glands.

Anodynes, which cause delirium and dilate the pupils.—Hyoscyamus niger. Extr. et Tinct. Belladonna, Extr. Succus. Tinct. et Emp. Atropia et Liquor. Atropiæ Sulphas. Stramonium. Extr.

Acro-Narcotics and Cathartics.—Staphisagria. Colchicum. Veratrum. Sabadilla.

Nux Vomica, Toxicodendron, and Arnica. *See* EXCITANTS, Special.

ANTISPASMODICA. *Antispasmodics.*

Antispasmodics are medicines prescribed for the purpose of allaying the irregular muscular contractions denominated Spasms. As these may arise from various causes, so whatever removes the cause will in many cases assuage the spasm and the pain which accompanies it. This may at one time be an Antacid or a Purgative, which removes a source of irritation from the intestinal canal; at another time, an Anodyne, which, by lulling pain, stops the irregular movements to which this gives origin; and if these should depend on debility, then strengthening diet and Tonics will prove Antispasmodic. The name is, however, usually applied to a group so peculiar in their action as to be accounted excitant by some and sedative by others, and therefore hardly require to be treated of separately. Though exciting the circulation, they have a sedative effect upon the nervous system in disease, apparently by stimulating and thus restoring it to a healthy state. They are remarkable for rapidity of action, as well as for their effects being temporary, and thus requiring repeated and even increased doses of the medicine. They are chiefly prescribed in nervous complaints, especially Hysteria, and in Spasmodic and Convulsive affections; also in Asthma, in Spasm in the stomach or intestinal canal, and sometimes in the advanced stages of Typhoid disease.

Valeriana, Inf., Tinct., and Tinct. Ammoniata.

Fœtid Gum-Resins.—Assafœtida, Tinct. et Enem. Galbanum. Sagapenum. Opopanax.

Ruta. Tanacetum. Anthemis et Ol.

Camphora. Aqua. Tinct et Tinct. comp. with Opium. Linim. with Oil. and Lin. Comp. with Ammonia and Spirit and Oil of Lavender.

Æther Sulph. Sp. Ætheris. Sp. Ætheris Nitrosi.

Sp. Ammoniæ arom. Sp. Ammoniæ fœtidus. Ammoniæ Carb.

Petroleum. Naphtha. Succini Ol.

Moschus. Castoreum. Tinct.

Narcotics and Sedatives.—Opium. Belladonna. (Atropia, Atropiæ Sulphas.) Stramonium. Hyoscyamus. Tabacum. Lobelia. Tinct. et Tinctura Ætherea. Cannabis indica. Conium and its alkali Conia. Physostigma.

Tonics.—Argenti Oxidum, Chloridum, et Nitras. Zinci Oxidum et Sulphas. Cupri Ammonio-Sulph. Bismuthi Nitras. Cinchona, Quinine, and other Tonics.

REFRIGERANTIA. *Refrigerants.*

Refrigerants have been defined to be "such medicines as diminish the force of the circulation, and reduce the heat of the body, without occasioning any diminution of sensibility or nervous energy." Dr Murray, alluding to the source of animal temperature, refers to the fact that the consumption of oxygen in the lungs and the temperature of the body are increased when the aliment received into the stomach is composed of substances, such as animal food and spirits, which contain a small proportion of oxygen. But when the temperature of the body is morbidly increased, if we introduce into the stomach substances containing a large proportion of oxygen, such, for instance, as the vegetable acids, we may succeed in reducing the morbid heat. The nutritious matter conveyed to the blood, containing thus a larger proportion of oxygen than usual, will be disposed to abstract less of it from the air in the lungs, and, consequently, less caloric will be evolved there. Dr Murray's views have long been admired for their ingenuity, but modern discoveries would seem to prove that they are probably also correct. Dr Blake, however, in his experiments on injecting different substances into the blood, found that all acids produced an impediment to the passage of the blood through the pulmonary capillaries.

But some Refrigerants, though powerful in effect, certainly act in a different way: thus, cold in the form of Ice, or of freezing mixtures, is the most powerful of Sedatives in all kinds of excitement. Evaporating lotions, with alcohol or ether, certainly act in the first part according to physical laws, by abstracting caloric. Care must be taken not to cover up parts to which such lotions are applied, or the heating effects of the spirit or ether will be experienced. Simple sponging of the whole or part of the body, with cold water, vinegar and water, or spirit and water, forms the most effective of Sedatives. Dr Royle has, in some of the severest cases of Jungle Remittent, kept the patients constantly sponged day and night, so that the pulse was controlled and preternatural heat kept down, while the usual remedies were producing changes in the secretions and subduing the fever.

External Cool Air. Cold Water. Ice. Freezing Mixtures.

Continued Sponging with Vinegar or Spirit and Water. Evaporating Lotions.

Vegetable acids, q. v. Trochisci Acidi Tartarici. Limonum Succus et Syr. Lemonade. Aurantii Fructus. Acetum. Syrupus Aceti. Tamarindus. Acetosella. Rumex Acetosa.

Potassæ Bitartras. Potassæ Nitras. Potassæ Chloras. Pot. Citras.

Mild Diaphoretics. Liq. Ammoniæ Acet. Liq. Ammon. Citratis. Effervescing Draughts.

SEDANTIA. *Sedativa. Contra-Stimulants.*

Sedatives, when strictly defined, are medicines which directly depress the energy of the nervous system without causing any previous excitement. Though there are few medicines which can be rigorously brought under this definition, there are several which may be prescribed in diseases of increased action, whether of the nervous or sanguineous system. Considerable differences of opinion have been entertained respecting the mode of action of the remedies which have been called Sedatives, some denying that there are any which can be strictly so called, others uniting them with Narcotics and Diffusible Stimulants, which first exalt and then depress nervous power, and also affect the mind, producing stupefaction. Dr Paris, Dr A. T. Thomson, and others, admit sedatives as a distinct class, in being distinguished from Narcotics by directly and primarily depressing the powers of life, without previously exciting either nervous force or the circulation. Though all which are now included under this head may not come strictly under this definition, they may yet be used to control inordinate action. However much writers may differ respecting the proper position of Sedatives in a classification, practitioners know that there are medicines which may be prescribed beneficially in cases of excitement, when they would reject the more powerful narcotics, and should avoid uniting them in a prescription. Though agreeing in the general effects which they produce, and generally in not affecting the mind or its functions, they differ in their mode of action.

Hydrocyanic', useful in allaying irritation and cough, and giving great relief in certain painful affections of the stomach, possesses a general anodyne and sedative effect; yet, in large doses, produces convulsions and syncope, and, in still larger, death without convulsion. Aconite, producing tingling without redness, quickly followed by numbness of the part to which it is applied, is particularly valuable in allaying the pain of severe neuralgic affections: when given internally, it diminishes the circulation, and acts as a powerful sedative. Hemlock and its alkali Conia have, in recent times, been ascertained to differ much from the narcotics with which Conium was usually classed, producing, to use Dr Christison's words, "swiftly-spreading paralysis of the motor nerves, exhausting the nervous energy of the motor nerves of the spinal cord, producing general paralysis and asphyxia from relaxation;" thus affording the appropriate remedy for tetanus and the effects of Strychnia, whose special stimulant action on the spinal cord produces permanent spasm of the muscles. The senses do not seem to be affected so long as respiration goes on. It has been supposed to extinguish sensation, because, by inducing paralysis, it takes away the power of expression. Conium, with its sedative, is reputed to unite deobstruent powers.

Digitalis first slightly excites but soon depresses the heart, and greatly lowers the circulation, acting somewhat on the intestinal canal, and efficiently as a Diuretic. Colchicum, Tobacco, and Lobelia, at first excitant, produce great nausea, depression, and relaxation of the muscles, and are hence employed to produce relaxation in spasmodic affections, and in the reduction of Dislocations. Of the Acro-Narcotics, Colchicum may also be placed here as acting on the liver and intestinal canal; it produces copious evacuations, extreme depression, and affords great relief from the pain of Rheumatism and of Gout. The latter effect may be experienced in slight cases, without the former. But the most useful and powerful methods which we have for producing depression are Ipecacuanha and the Antimonial preparations, which are also given as Diaphoretics, Expectorants, and Emetics, and which in suitable doses produce extreme nausea, the greatest depression, and consequently powerful sedative effects. Hence Tartar-emetic is one of the most effective agents in contra-stimulant treatment: it is, moreover, the agent which has been most frequently employed when it has been required to increase the dose of the contra-stimulant in proportion to the degree of excitement. Thus was ascertained the capability of the body of bearing much larger doses of Tartar-emetic than was previously thought possible,—which has been named *tolerance* of medicines;—thus adding another to the different modes in which medicines seem to act and to produce their effects, and also increasing the difficulty of making a good Physiological or Therapeutical arrangement of the Materia Medica.

Nitrogen, Sulphuretted Hydrogen, and Carbonic acid Gas, act as Sedatives when inhaled, but all are poisonous.

Acidum Hydrocyanicum Dil. Lauro-Cerasus. Amygdalæ Amaræ. Oil of Bitter Almonds. Cyanides of Potassium and Zinc.

Ferrocyanide of Potassium. Ferri Percyanidum.

Benumbent and Sedative.—Aconitum Napellus. Extr. et Tinct. Aconitia. Unguentum. Liquor et Lotio.

Paralysers.—Conium maculatum, Extr. (Succus spissatus), Tinct. Pil. comp. with Ipecac. Ung. et Cataplasm.

Anticonvulsive and Anodyne.—Cannabis sativa. Extr. et Tinct.

Digitalis. Infusum. Tinctura. Digitalinum.

Tabacum. Enema. Lobelia inflata.

Antimonii et Potassæ Tartras. Vinum. Ipecacuanha. Pulvis et Vinum, given in nauseating doses.

Plumbi Acetas et Pil. Opiatæ. Plumbi Subacetatis Liquor et L. Dilutus.

Antiphlogistic Treatment generally, which includes Blood-letting, Leeches, Purgatives, Refrigerants, the application of Cold, continued Sponging, Demulcents.

Anæsthetics.—Ether and Chloroform, or Chloroform inhaled.

Hydrocyanic' and Creasote give great relief from pain in the Stomach in Gastrodynia. So does Nitrate of Bismuth. Oxalate of Cerium relieves vomiting of Hysteria and Pregnancy. Calomel, in gr. x. and gr. xx. doses, often does good, and acts like a Sedative, in cases of acute Dysentery.

Various circumstances influence the action of medicines, on account of which they cannot always be prescribed in the same doses, even to the same individual; but besides this, the mode of preparation, age, sex, mode of life, climate, and peculiar idiosyncrasies, but especially age—all modify the doses in which Medicines should be prescribed. The Table formed by Gaubius is of some use as a general guide for age.

GAUBIUS' TABLE.

Regulating the ordinary Proportion of Doses according to the Age of the Patient.

For an adult, suppose the dose to be	1	or	60	grains.
Under 1 year will require	$\frac{1}{12}$	,,	5	,,
,, 2 ,, ,,	$\frac{1}{8}$	,,	8	,,
,, 3 ,, ,,	$\frac{1}{6}$	,,	10	,,
,, 4 ,, ,,	$\frac{1}{4}$	,,	15	,,
,, 7 ,, ,,	$\frac{1}{3}$	,,	20	,,
,, 14 ,, ,,	$\frac{1}{2}$	,,	30	,,
,, 20 ,, ,,	$\frac{2}{3}$	,,	40	,,
,, 21 ,, to 60, the full dose, or	1	,,	60	,,

Above this age, an inverse gradation must be observed.

POISONS.

Poisons *as arranged by Dr Christison, with the* Antidotes, *&c., mentioned in the foregoing pages.*

In most cases the stomach requires to be quickly evacuated, either by emetics or by the stomach-pump; but with corrosive poisons this is not always safe. The suitable antidotes are to be prescribed, sometimes viscid substances to involve the poison. In many cases irritation is to be allayed, and inflammation subdued; but in others, moderate stimulants are necessary. With the poisonous gases, fresh air is essential, and cold affusion useful.

Irritant Poisons.

Acids.—Sulphuric. Nitric. Phosphorus and acid. Hydrochloric and Nitro-hydrochloric acid. Tincture of Perchloride of Iron. Oxalic′, Tartaric′, Citric′, and Acetic acids.

Alkalies.—Ammonia, Potash, its Carbonate, Soda, &c. Lime. Nitre. Alkaline Sulphurets.

Solution of Chlorine, Iodine, and Iodide of Potassium. Bromine and Bromide of Potassium.

Baryta, salts of. Chloride of Barium (treated with Sulphates of Magnesia and Soda, also Carbonates. Stomach-pump or Emetics.)

Arsenic. Arsenious Acid. Liquor Potassæ Arsenitis. Sodæ Arsenias. Ferri Arsenias. (Sulphurets, or Hydrated Peroxide of Iron. Magnesia in a gelatinous state, or very light Magnesia, will remove about 1-25th of its weight of Arsenic from its solution in water.) (*See* P. J. vi. 137.)

Mercury, Chloride, Cyanide, and its irritant salts. (Dr Paris recommends Tartar Emetic as an Emetic in poisoning by Corrosive Sublimate.)

Copper, salts of. (Hydrated oxide of iron has been recommended.)

Antimony, salts of. Zinc, &c. Lead, salts of (with Milk and Albumen, Sulphate of Soda and Magnesia). Silver, Nitrate of, &c.—(Administer Common Salt and some of the Incompatibles.)

Vegetable Acrids.—Euphorbium. Croton. Colocynth. Elaterium. Mezereon. Gamboge. Jalap. Savine.

Animal Acrids.—Cantharides.—(Evacuate Stomach. Demulcents. Allay irritation with Camphor, Dover's Powder, &c.)

Narcotic Poisons.

Opium and its preparations. Henbane. Lactuca.
Hydrocyanic′. Laurel-water. Oil of Bitter Almonds (?)

Poisonous Gases.—Chlorine. Ammonia. Hydrosulphuric′. Carbonic acid. Carburetted Hydrogen. (With all, exposure to pure air, artificial respiration and affusion of cold water.)

Narcotic Acrid Poisons.

General Rule for Active Vegetable Poisons.—Give a large quantity of Animal Charcoal immediately; then, after a short time, a Zinc emetic.

Belladonna. Atropia. Stramonium. Henbane. Tobacco.
Conium or Hemlock, and poisonous Umbelliferæ.
Nux Vomica. Strychnia. (Remove poison from stomach.)
Aconite. Black and White Hellebore. Colchicum. Sabadilla.
Cocculus indicus. Digitalis. Digitalin.

Alcohol. Ether.—(Evacuate stomach; cold affusion over head, and evaporating lotions; Leeches. Ammonia as a Stimulant.)

TABLE OF MINERAL WATERS.

ACCORDING TO THE ANALYSES OF BERGMANN, SCHWEITZER, AND OTHERS.

I. CARBONATED WATERS.

Sparkling. 100 cubic inches yield from 50 to 160 cubic inches of Carbonic acid Gas. Exhilarating; refrigerant.

Ems, Carlsbad, Kissengen, Seltzer, Pyrmont, Spa.

II. SULPHURETTED WATERS.

Have a nauseous smell. Owe their properties to Sulphuretted Hydrogen Gas, of which 100 cubic inches contain from 5 to 20 cubic inches in a free state. Water frequently warm. Stimulant; diaphoretic; alterative.

Cheltenham and Harrogate Sulphur Springs (England). Aix-la-Chapelle and Baréges (France). Nenndorf (Hesse).

III. SALINE WATERS.

Contain Carbonates, Sulphates, and Chlorides of the Alkaline and Earthy bases. Solid constituents vary from 2 to 150 in 10,000 parts.

a. Warm and feebly saline. Diaphoretic.
Vichy, Baden-Baden, Bath, Bristol, Buxton, Matlock.

b. Cold and bitter. Contain Sulph. Soda. Purgative.
Carlsbad, Cheltenham, Leamington.

c. Cold and bitter. Contain Sulph Magnesia. Purgative.
Epsom, Scarborough, Seidlitz.

d. Cold and briny. Contain Chloride of Sodium. Purgative.
Ashby-de-la-Zouch, Kreuznach, Pyrmont, Homburg.

IV. CHALYBEATE WATERS.

Owe their properties to Iron. Some deposit the Sesquioxide on exposure. These contain the Carbonate of Iron, held in solution by Carbonic Acid. Others contain the Iron chiefly in the condition of Sulphate. Contain from 3 to 15 grains of Oxide of Iron in 10,000 parts. Tonic; restorative.

a. Carbonated.
Tunbridge, Brighton, Spa.

b. Sulphated.
Isle of Wight, Alexisbad, Passy.

VOLUMETRIC TEST SOLUTIONS, EMPLOYED IN THE B. P.*

Volumetric solutions, before being used, should be shaken, in order that they may be throughout of uniform strength. They should also be preserved in stoppered bottles.

The tube used with these solutions is an Alkalimeter, or Burette, which, when filled to 0, holds 1000 grains of distilled water at 60°, and is divided into 100 parts of equal capacity.

VOLUMETRIC SOLUTION OF SODA.

(Soda, $NaO = 31$.)

The quantity of this solution which fills the volumetric tube to 0, includes thirty-one grains of Soda, and will therefore neutralise an equivalent in grains of any monobasic acid. (A quantitative test for acids.)

VOLUMETRIC SOLUTION OF OXALIC ACID.

(Oxalic Acid crystallised, $HO, C_2O_3 + 2\ HO = 63$.)

The quantity of this solution which fills the volumetric tube to 0 includes exactly sixty-three grains of crystallised oxalic acid, and is therefore capable of neutralising an equivalent in grains of any alkali or alkaline carbonate. (A quantitative test for alkalies.)

VOLUMETRIC SOLUTION OF BICHROMATE OF POTASH.

(Bichromate of Potash, $KO, 2CrO_3 = 147{\cdot}5$.)

The quantity of this solution which fills the volumetric tube to 0 contains $\frac{1}{10}$ of an equivalent, in grains, of the Bichromate of Potash, and, when added to a solution of a protosalt of iron acidulated with hydrochloric acid, is capable of converting $\frac{1}{10}$ of six equivalents of iron (16·8 grains) from the state of a protosalt to that of a persalt.

In practising this volumetric process, it is known that the whole of the protosalt has been converted into a persalt when a minute drop of the solution, placed in contact with a drop of the solution of ferridcyanide of potassium on a white plate, ceases to strike with it a blue colour. (Quantitative test for Protosalts of Iron.)

VOLUMETRIC SOLUTION OF HYPOSULPHITE OF SODA.

(Hyposulphite of Soda crystallised, $NaO, S_2O_2 + 5\ HO = 124$.)

This solution is used for estimating free iodine, an object which it accomplishes by forming with the iodine, iodide of sodium and tetrathionate of soda. 1000 gr.-measures of it include $\frac{1}{10}$ of two equivalents of the hyposulphite in grains, and therefore correspond to 12·7 grains of free iodine.

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* The tests which require these solutions are printed in Italics throughout this work. 1000 gr.-measures of each solution contain generally a chem. equiv., or one-tenth of a chem. equiv. in grains of the test used. This fills the tube to 0.

VOLUMETRIC SOLUTION OF IODINE.

(Iodine, I=127.)

This solution may be employed for determining the amount of sulphuretted hydrogen or of a metallic sulphuret in a fluid, but is chiefly used for the estimation of sulphurous and arsenious acids. It is dropped from the volumetric tube into the liquid to be tested until free iodine begins to appear in the solution. 1000 gr.-measures of it include 12·7 grains ($\frac{1}{10}$ of an equivalent) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous, and 4·95 grains of arsenious acid.

VOLUMETRIC SOLUTION OF NITRATE OF SILVER.

(Nitrate of Silver, $AgO, NO_5=170$.)

The quantity of this solution which fills the volumetric tube to 0, includes seventeen grains of nitrate of silver, or $\frac{1}{10}$ of an equivalent of the salt in grains. Upon dropping it into dilute hydrocyanic acid rendered alkaline by soda, the precipitate first formed is upon agitation redissolved, and continues to be so until the whole of the cyanogen of the acid has united with the sodium and the silver, forming the double cyanide of sodium and silver. In such experiments 1000 gr.-measures of the solution correspond to 5·4 grains of absolute hydrocyanic acid.

TABLE OF FORMULÆ of the Chemical Substances in the British Pharmacopœia according to the Old and New Systems of Notation. (See p. 18.)

	Old, or Present Notation.	Proposed New Notation.
Acidum Aceticum,	$C_4 H_3 O_3, H O$	$H C_2 H_3 O_2$
Arseniosum,	$As O_3$	$As_2 O_3$
Benzoicum,	$C_{14} H_5 O_3, H O$	$H C_7 H_5 O_2$
Carbolicum,	$C_{12} H_5 O, H O$	$H C_6 H_5 O$
Citricum,	$C_{12} H_5 O_{11}, 3 H O$	$H_3 C_6 H_5 O_7 . H_2 O$
Gallicum,	$C_{14} H_3 O_7, 3 H O$	$H_3 C_7 H_3 O_5 . H_2 O$
Hydrochloricum,	$H Cl$	$H Cl$
Hydrocyanicum,	$H, C_2 N$	$H C N$
Nitricum,	$N O_5, H O$	$H N O_3$
Phosphoricum,	$P O_5, 3 H O$	$H_3 P O_4$
Sulphuricum,	$S O_3, H O$	$H_2 S O_4$
Sulphurosum,	$S O_2$	$S O_2$
Tannicum,	$C_{54} H_{22} O_{34}$	$C_{27} H_{22} O_{17}$
Tartaricum,	$C_8 H_4 O_{10}, 2 H O$	$H_2 C_4 H_4 O_6$
Æther,	$C_4 H_5 O$	$C_4 H_{10} O$
Alcohol Amylicum,	$C_{10} H_{12} O_2$	$C_5 H_{12} O$
Alumen,	$\left\{ N H_4 O, S O_3, Al_2 O_3, 3 S O_3 + 24 H O \right\}$	$N H_4 Al (S O_4)_2 . 12 H_2 O$
Ammoniæ Benzoas,	$N H_4 O, C_{14} H_5 O_3$	$N H_4, C_7 H_5 O_2$
Carbonas,	$2 N H_4 O, 3 C O_2$	$N_4 H_{16} C_3 O_8$
Phosphas,	$2 N H_4 O, H O, P O_5$	$(N H_4)_2 H P O_4$

TABLE OF FORMULÆ—*continued.*

	Old, or Present Notation.	Proposed New Notation.
Ammonii Bromidum,	$N H_4, Br$	$N H_4, Br$
Chloridum,	$N H_4, Cl$	$N H_4, Cl$
Antimonii Oxidum,	$Sb O_3$	$Sb_2 O_3$
Sulphuretum,	$Sb S_3$	$Sb_2 S_3$
Potassio-Tartras,	$K O, Sb O_3, C_8 H_4 O_{10}$	$K Sb C_4 H_4 O_7.H_2 O$
Aqua,	$H O$	$H_2 O$
Argenti Nitras,	$Ag O, N O_5$	$Ag, N O_3$
Oxidum,	$Ag O$	$Ag_2 O$
Atropia,	$C_{34} H_{23} N O_6$	$C_{17} H_{23} N O_3$
Beberiæ Sulphas,	$C_{35} H_{20} N O_6, H O, S O_3$	$C_{35} H_{40} N_2 O_6, H_2 S O_4$
Bismuthi Carbonas,	$2 (Bi O_3, C O_2) H O$	$2 (Bi_2 C O_5).H_2 O$
Subnitras,	$Bi O_3, N O_5, 2 H O$	$Bi N O_4, H_2 O$
Borax,	$Na O, 2 B O_3, + 10 H O$	$Na_2 B_4 O_7.10 H_2 O$
Cadmii Iodidum,	$Cd I$	$Cd I_2$
Calcii Chloridum,	$Ca Cl$	$Ca Cl_2$
Calcis Carbonas,	$Ca O, C O_2$	$Ca C O_3$
Hydras,	$Ca O, H O$	$Ca H_2 O_2$
Phosphas,	$3 Ca O, P O_5$	$Ca_3 P_2 O_8$
Calx,	CaO	$Ca O$
Cerii Oxalas,	$2 Ce O, C_4 O_6 + 6 H O$	$Ce C_2 O_4.3 H_2 O$
Chloroformum,	$C_2 H Cl_3$	$C H Cl_3$
Cupri Sulphas,	$Cu O, S O_3 + 5 H O$	$Cu S O_4, 5 H_2 O$
Ferri Arsenias,	$3 Fe O, As O_5$	$Fe_3 As_2 O_8$

TABLE OF FORMULÆ—*continued.*

	Old, or Present Notation.	Proposed New Notation.
Ferri Carbonas,	$Fe\,O, C\,O_2$	$Fe\,C\,O_3$
Iodidum,	$Fe\,I$	$Fe\,I_2$
Oxidum Magneticum,	$Fe_3\,O_4$	$Fe_3\,O_4$
Peroxidum Hydratum,	$Fe_2\,O_3, H\,O$	$Fe_2\,O_3.H_2\,O$
Phosphas,	$3\,Fe\,O, P\,O_5$	$Fe_5\,P_2\,O_8$
Sulphas,	$Fe\,O, S\,O_3 + 7\,H\,O$	$Fe\,S\,O_4.7\,H_2\,O$
Glycerinum,	$C_6\,H_8\,O_6$	$C_3\,H_8\,O_3$
Hydrargyri Iodidum Rubrum,	$Hg\,I$	$Hg\,I_2$
Viride,	$Hg_2\,I$	$Hg\,I$
Oxidum Rubrum,	$Hg\,O$	$Hg\,O$
Perchloridum,	$Hg\,Cl$	$Hg\,Cl_2$
Subchloridum,	$Hg_2\,Cl$	$Hg\,Cl$
Sulphas,	$Hg\,O, S\,O_3$	$Hg\,S\,O_4$
Hydrargyrum Ammoniatum,	$N\,H_2\,Hg_2\,Cl$	$N\,H_2\,Hg\,Cl$
Lithiæ Carbonas,	$L\,O, C\,O_2$	$L_2\,C\,O_3$
Citras,	$3\,L\,O, C_{12}\,H_5\,O_{11}$	$L_3\,C_6\,H_5\,O_7$
Magnesia,	$Mg\,O$	$Mg\,O$
Magnesiæ Carbonas,	$3\,(Mg\,O, C\,O_2) + Mg\,O + 5\,H\,O$	$(Mg\,O, C\,O_3)_3\,Mg\,O.5\,H_2\,O$
Sulphas,	$Mg\,O, S\,O_3 + 7\,H\,O$	$Mg\,S\,O_4.7\,H_2\,O$
Manganesii Oxidum Nigrum,	$Mn\,O_2$	$Mn\,O_2$
Morphiæ Acetas,	$C_{34}\,H_{19}\,N\,O_6, C_4\,H_3\,O_3 + H\,O$	$C_{17}\,H_{19}\,NO_3.C_2\,H_4\,O_2$
Hydrochloras,	$C_{34}\,H_{19}\,N\,O_6, H\,Cl, + 6\,H\,O$	$C_{17}\,H_{19}\,N\,O_3.H\,Cl.3\,H_2\,O$
Plumbi Acetas,	$Pb\,O, C_4\,H_3\,O_3 + 3\,H\,O$	$Pb\,(C_2\,H_3\,O_2)_2.3\,H_2\,O$

TABLE OF FORMULÆ—*continued.*

	Old, or Present Notation.	Proposed New Notation.
Plumbi Iodidum,	$Pb I$	$Pb I_2$
Nitras,	$Pb O, N O_5$	$Pb (N O_3)_2$
Oxidum,	$Pb O$	$Pb O$
Potassa,	$K O, H O$	$K H O$
Potassæ Acetas,	$K O, C_4 H_3 O_3$	$K C_2 H_3 O_2$
Bicarbonas,	$K O, H O, 2 C O_2$	$K H C O_3$
Bichromas,	$K O, 2 Cr O_3$	$K_2 Cr_2 O_7$
Carbonas,	$K O, C O_2$	$K_2 C O_3$
Chloras,	$K O, Cl O_5$	$K Cl O_3$
Citras,	$3 K O, C_{12} H_5 O_{11}$	$K_3 C_6 H_5 O_7$
Nitras,	$K O, N O_5$	$K N O_3$
Permanganas,	$K O, Mn_2 O_7$	$K Mn O_4$
Sulphas,	$K O, S O_3$	$K_2 S O_4$
Tartras,	$2 K O, C_8 H_4 O_{10}$	$K_2 C_4 H_4 O_6$
Tartras Acida,	$K O, H O, C_8 H_4 O_{10}$	$K H C_4 H_4 O_6$
Potassii Bromidum,	$K Br$	$K Br$
Iodidum,	$K I$	$K I$
Quiniæ Sulphas,	$C_{40} H_{24} N_2 O_4, H O, S O_3 + 7 H O$	$(C_{20} H_{24} N_2 O_2)_2 H_2 S O_4 . 7 H_2 O$
Saccharum,	$C_{24} H_{22} O_{22}$	$C_{12} H_{22} O_{11}$
Saccharum Lactis,	$C_{24} H_{24} O_{24}$	$C_{12} H_{24} O_{12}$
Santoninum,	$C_{30} H_{18} O_6$	$C_{15} H_{18} O_3$
Soda Caustica,	$Na O, H O$	$Na H O$

TABLE OF FORMULÆ—*continued.*

	Old, or Present Notation.	Proposed New Notation.
Sodæ et Potassio Tartras,	$Na\,O, K\,O, C_8\,H_4\,O_{10} + 8\,H\,O$	$Na\,K\,C_4\,H_4\,O_6.4\,H_2\,O$
Acetas,	$Na\,O, C_4\,H_3\,O_3 + 6\,H\,O$	$Na\,C_2\,H_3\,O_2.3\,H_2\,O$
Arsenias,	$2\,Na\,O, H\,O, As\,O_5 + 14\,H\,O$	$Na_2\,H\,As\,O_4.7\,H_2\,O$
Bicarbonas,	$Na\,O, H\,O, 2\,C\,O_2$	$Na\,H, C\,O_3$
Carbonas,	$Na\,O, C\,O_2 + 10\,H\,O$	$Na_2\,C\,O_3.10\,H_2\,O$
Nitras,	$Na\,O, N\,O_5$	$Na\,N\,O_3$
Phosphas,	$2\,Na\,O, H\,O, P\,O_5 + 24\,H\,O$	$Na_2\,H\,P\,O_4.12\,H_2\,O$
Sulphas,	$Na\,O, S\,O_3 + 10\,H\,O$	$Na_2\,S\,O_4.10\,H_2\,O$
Valerianas,	$Na\,O, C_{10}\,H_9\,O_3$	$Na\,C_5\,H_9\,O_2$
Sodii Chloridum,	$Na\,Cl$	$Na\,Cl$
Spiritus (Alcohol),	$C_4\,H_6\,O_2$	$C_2\,H_6\,O$
Strychnia,	$C_{42}\,H_{22}\,N_2\,O_4$	$C_{21}\,H_{22}\,H_2\,O_2$
Zinci Acetas,	$Zn\,O, C_4\,H_3\,O_3 + 2\,H\,O$	$Zn\,(C_2\,H_3\,O_3)_2.2\,H_2\,O$
Carbonas,	$Zn\,O, C\,O_2$	$Zn\,C\,O_3$
Chloridum,	$Zn\,Cl$	$Zn\,Cl_2$
Oxidum,	$Zn\,O$	$Zn\,O$
Sulphas,	$Zn\,O, S\,O_3 + 7\,H\,O$	$Zn\,S\,O_4.7\,H_2\,O$
Valerianas,	$Zn\,O, C_{10}\,H_9\,O_3$	$Zn\,(C_5\,H_9\,O_2)_2$

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